THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XIV. Part 10. 10th October, 1916.

APPLE CULTURE IN VICTORIA.

(Continued from page 532.)

By J. Farrell, Orchard Supervisor.

Propagation of Young Trees.

In starting an apple orchard it is a matter of prime importance to commence with good trees, which should, preferably, be yearling "whip" growths on double-worked blight-proof stocks.

The varieties mostly used for stocks are Northern Spy and Winter Majetin, as they resist the attack of woolly aphis (*Eriosema lanigera*).

If not worked by the intending planter, early application should be made to nurserymen for the young trees necessary. They should be ordered the season before being required for planting, as it frequently happens that, when orders are delayed, growers experience difficulties in obtaining supplies.

For many years past nurserymen have not been able to meet the annual demand for popular varieties. The placing of early requisitions with the propagators gives them an opportunity to supply the required number of well-worked trees of even standard and good quality.

The variety desired for planting may be either budded or grafted on to stocks produced from root grafts or layers. Seedlings make undesirable stocks because their roots are mostly susceptible to the attack of woolly blight. The use of suckers is also to be deprecated, as they generally throw up other suckers, and particularly when their roots are interfered with during the process of cultivation. This has an injurious effect on the trees, fruit production being reduced while the cost of working the orchard is increased.

Double-worked Stocks.

A double-worked blight-proof stock consists of two portions of the blight-resistant variety intended for use. A piece of root is employed as a "starter" on which is grafted a scion, or portion of yearling wood, which produces the shoot on which the desired variety may be either budded or grafted.

Double-worked Northern Spy root grafts are the stocks recommended, and they are mostly favoured by the fruit-growers in this State.

Plate 16 shows method of making this stock. Fig. 1 (A) is a piece of Northern Spy root 2½ inches long, cut with grafting knife and tongued (*a*). Fig. 1 (B) is a portion of yearling wood of the same variety 4 inches long cut and tongued (*b*). The root and scion are then placed together and the tongues put into each other to make a firm graft, and tied with a piece of soft string. Fig. 2 shows the grafting operation completed. The root graft is planted during early spring, and the bud, Fig. 2 (*a*), is allowed to project above the soil level (*b*). The sap commences to move in the starter (*e*) (*d*), that is, the piece of root on which the scion is grafted. Fibrous roots are thrown out, and a cambium connexion is soon formed with the scion (*a*) (*d*). Fibrous roots are also thrown out at the nodes (*c*) to (*d*), and from these the tree's future root system is mainly formed.

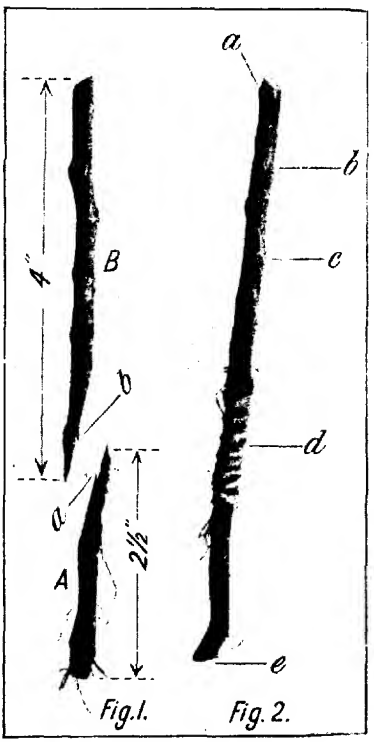

Plate 16.—Root Grafts.

This characteristic of the Northern Spy scion to establish a root system for itself independent altogether of the root-stock on which it is grafted, often gives rise to the erroneous idea of a diseased condition, being mistaken for crown gall or hairy root.

Plate 17, Fig. 1, shows development of the root graft during the first growing period after it was planted, the original graft being (*d*) to

(*b*), and (*h*) the surface level. The starter (*d*) to (*a*) made a weak growth on account of the scion (*a*) to (*b*) having sent out strong roots from the nodes between (*f*) and (*a*), while a strong shoot was sent up from (*b*) which was originally the terminal bud. This is an ideal

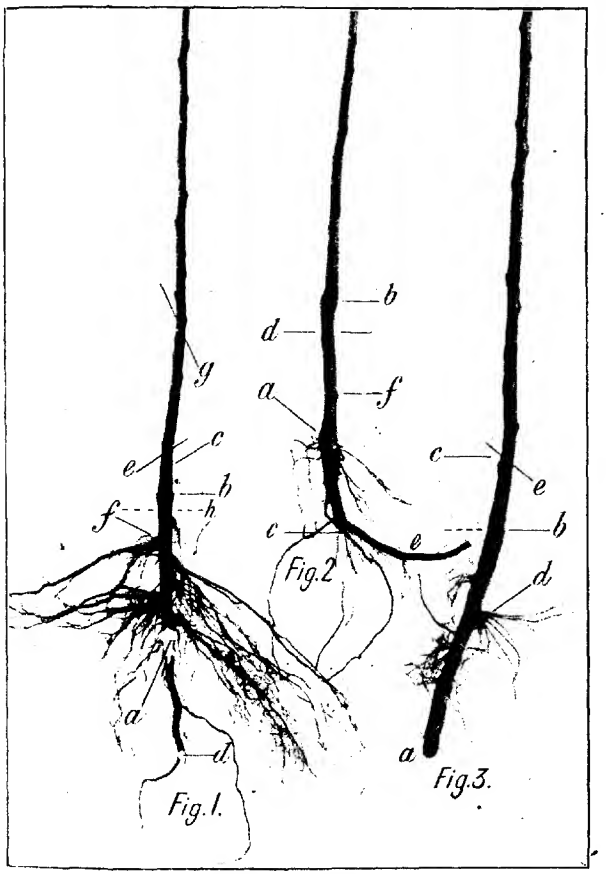

Plate 17.—Stocks.

stock in which a bud of the selected variety may be inserted (*c*) during February and the growth above it removed at (*e*) in September following. Should the bud miss, the stock may be cut (*g*) and top-grafted about 9 inches from the ground, when the sap rises, in the early spring.

Fig. 2 is a stock worked similarly to Fig. 1, the starter (*a*) to (*c*) being Northern Spy, but the scion (*a*) to (*b*) Winter Majetin, and when in the nursery row (*d*) represents the ground level. The starter made a stronger growth than in Fig. 1, but as almost invariably happens, in the case of the Winter Majetin, no roots were thrown out from (*f*) or the other nodes on the scion. This is also the case when the Majetin is worked on its own starter.

It will be observed that when a stock has to depend solely upon the starter to produce the root system of the tree, such root system is less perfect than when roots are given out by the scion also. The development of the strong root (*e*) indicates the influence of the scion upon the starter in this respect. The Majetin on its own starter usually produces a similar result.

Stocks Produced from Layers.

Plate 17, Fig. 3, is a stock cut (*a*) from the parent Northern Spy layer. To produce these stocks a Northern Spy tree is planted, and when a few years old a trench, about 8 inches deep, is dug in line with it, and the tree is bent down into the trench, and covered in with the earth. Trenches about 10 inches deep and running parallel to the layer, on both sides, about 15 inches away from it, are dug to insure perfect drainage.

During the first year after this treatment of the layer, young shoots are thrown up from the nodes. These shoots give out roots at the node (*d*) as well as from the others beneath the surface level (*b*).

As a rule these stocks are removed from the layer during early spring and planted out in rows, to the same depth (*b*) as when on the layer, and cut (*e*) to allow bud (*c*) to produce the shoot on which the desired variety may be either budded or grafted as explained in connexion with Fig. 1.

During the year following the removal of the first stocks from the layer, the young shoots are produced at the points at which the first stocks were cut off. This process, continued during succeeding years, causes the development of extensive stools from which great numbers of stocks are obtained.

Budding.

In order to secure a high percentage of successfully budded stocks it is desirable that the budding operation in each case should be carefully executed. The conditions governing the sap flow in the stocks during the months of January and February are, as a rule, more conducive to successful budding than those existing at any other time.

The sketches in Plate 18 depict method of budding. Fig. 1 (*a*) is a portion of yearling wood, of the variety selected for propagation, and from which the buds are secured. Neither the buds near the base side, nor yet near the terminal, are chosen. The leaf is first cut off as indicated (*g*). Then the budding knife is drawn from (*e*) to (*f*), and the bud, with a thin strip of wood about ¾ inch in length, to which it is attached, care-

fully removed. Fig. 1 (*b*) is side view, (*c*) front, and (*d*) the back of the bud.

To insert the bud in the stock, Fig. 2, the budding knife is drawn upward to make the vertical incision (*a*) about 1 inch in length, and the transverse incision (*b*) completes a (T). When this has been done, the bark may be lifted, with the budding knife, as shown in the diagram, and the bud carefully inserted. Fig. 3 shows the bud in position and the bark closed in around it. Fig. 4 illustrates method of tying the budded part. A piece of prepared raffia is used for this purpose. The

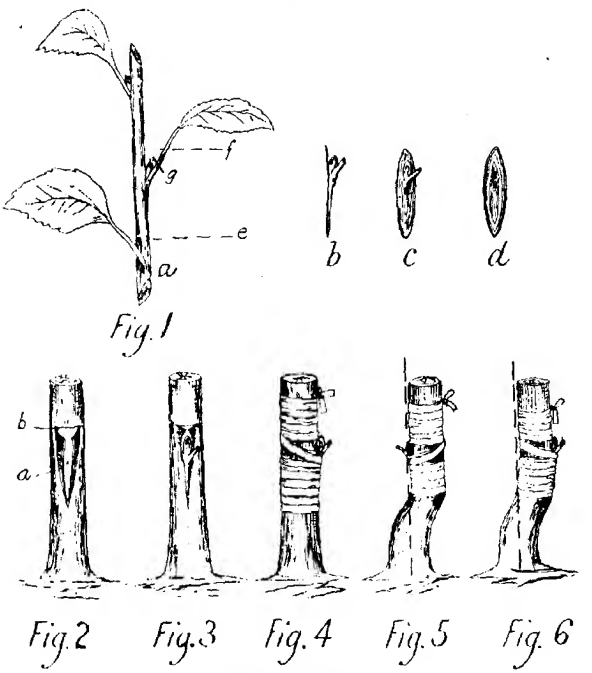

Plate 18.—Budding.

raffia should be neatly and firmly applied with a view to excluding the air from the wound until the bud has taken.

As a rule stocks produced from root grafts are fairly straight, and in such cases it is immaterial on what side of the stock the bud is inserted. But when, as in the case of the stock represented by Fig. 5, the growth from the terminal bud on the scion of the root graft strikes off at an angle, producing a crooked stem, it is advisable to place the bud on the inside of the bend, as shown, so that it may grow in the direction

of the dotted vertical line, and thus produce a straight tree. If the bud is inserted on the outside like Fig. 6, the tendency is to exaggerate the evil and render the tree less amenable to pruning and general management.

When it is observed that the bud has taken, the growth above it may be removed in early spring, as explained in connexion with Plate 17, Fig. 1 (*e*).

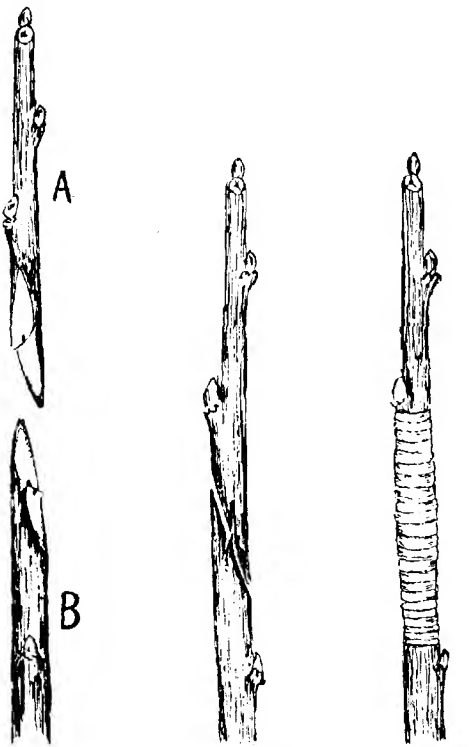

Plate 19.—Grafting.

Grafting.

Should the bud miss, and if it is desired to utilize the stock during the ensuing year, it may be top-grafted. Plate 19 illustrates the whip tongue method of grafting, which is the easiest and most successful when working on small wood. Fig. 1 (A) is a scion and (B) the stock. An upward cut is made, with the grafting knife, in the stock, about 9 inches above the ground, and then it is tongued as shown.

The starting of the branch system of the tree, on the three-bud or equilateral triangle principle, is advocated. Consequently, a scion or portion of yearling wood and containing three buds like (A) is taken from the variety selected for propagation. A downward cut, at the same angle to the vertical as that in the stock, is made in the scion. Then it also is tongued so that it may fit correctly on the stock when placed in position. Fig. 2 shows the relative positions taken up by the scion and stock. When they are drawn firmly together and bound with a piece of waxed cloth about 9 inches long by 1 inch wide, like Fig. 3, the callus which causes the union between the scion and stock is soon formed.

The growths, from which the scions are to be taken, should be collected during winter when pruning, and heeled in until required for use. The wood, when so treated, usually gives a much higher percentage of successful grafts than when taken fresh from the tree. Yearling upright growths of medium strength should be selected. When viewed from the vertical any three consecutive buds on a shoot of this kind usually forms an equilateral triangle, whereas the buds on horizontal and pendulous growths mostly lean to one side of the shoot, in consequence of the leaves, at the bases of which they are produced inclining upwards.

In propagating trees, whether by grafting or budding, it is important to choose scions from trees that have proved to be of good bearing habit and producing typical fruit of the variety selected.

It is only in this way that hereditary influence is conserved, and no other reason can be assigned in many cases for the variation in fruit production of different trees except the want of bud selection.

Single-worked Stocks.

A single-worked root-grafted stock consists of a portion of root of the Northern Spy or other blight-resistant variety, on to which is grafted direct the one chosen for propagation. In most cases, our cultivated varieties throw out roots from the nodes, and at the callus on the scion, when single working is adopted.

A tree worked in this manner is practically on its own roots, as the starter is invariably subdued. Many such trees, however, are found with their roots infested with woolly blight, when this pest is present in the orchard, and the practice is not to be recommended unless the variety itself is blight-proof.

The Young Trees.

Plate 20 is a photograph of three typical yearling trees taken from the nursery row. Figs. 1 and 3 are Jonathan, Fig. 2 is Granny Smith: (*a*) shows the points at which the stocks were budded, and, before the trees were lifted, (*b*) represents the ground line. Yearling whip growths invariably make the better shaped trees. But nurserymen frequently top the young growths (*c*) about 18 inches from the ground, during December and January, in order to make a head.

This operation, like summer pruning, has a stunting effect on the

weak growth. Fig. 1 was the weakest tree at the time the tops of Figs. 2 and 3 were removed, but on account of not having been interfered with, it became the strongest at the end of the period of growth.

When the tops are removed as explained, the shoot sent up from the terminal buds (*c*) (Figs. 1 and 2) on the young softwood usually runs to the vertical, forming an objectionable centre, which has to be removed, when planted out, in order to start the frame work of the tree on proper lines. As a rule, when trees are treated in this manner in the nursery, to prematurely form heads, they are usually cut too high. To remedy this defect, when they are planted out in the orchard the whole of this head should be removed by cutting at (*d*), when a natural branch system may be established from the three buds, on the stronger wood, immediately below that point.

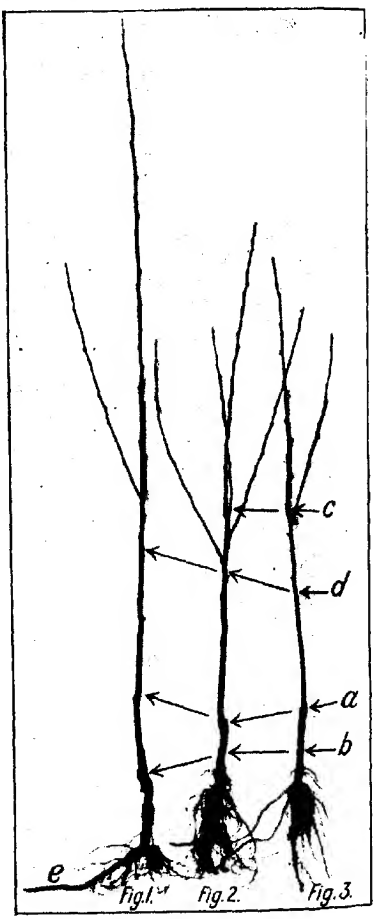

Plate 20.—Typical Young Trees.

When trees are being planted out in the orchard, their roots are usually cut back to about 6 inches. But as an experiment, the roots of these trees were almost completely removed, as shown in Plate 21. The strong root or foot in Plate 20, Fig. 1 (*e*) was produced to the detriment of the remainder of the root system. Instead of retaining about 1 inch of this root, as shown in Plate 21, Fig. 1 (*a*), it should have been completely removed by cutting at the base.

In the case of Figs. 2 and 3, there were no strong roots, but the fibrous ones were severely dealt with. The trees were then planted out

to the same depth at which they grew in the nursery, and were lifted again after the vegetative period and photographed. The growth made by the roots and branches is shown in Plate 22. It will be observed that the portion of strong root retained again developed into a foot (Fig. 1 (*a*)) at the expense of the other roots, while Figs. 2 and 3 made strong, evenly balanced, root systems.

Regulating the Branch System.

It frequently happens that when the young whip-growths, Jonathan particularly, Plate 22, Fig. 1, are cut for the first time a stronger and more vertical growth is sent out from the uppermost bud (*b*) than from the other two buds below it. When this growth reached the point (*c*) the terminal bud was pinched out. This treatment had a stunting effect upon the leader, and a greater quantity of sap was thrown into the one immediately below it.

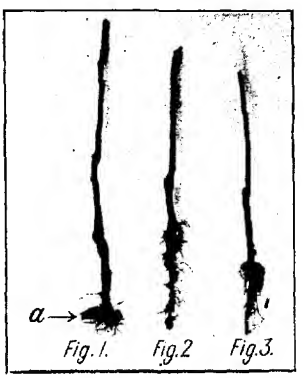

Plate 21.—Young Trees Cut to Desired Height.

This one then made a stronger growth in consequence, and when it reached the point (*d*) its terminal bud was removed. By that time the three small growths above (*f*) were produced, and their terminal buds (*i*) and (*j*) were also removed.

Through treating the two stronger leaders in this manner the lower one, which was at first thrown out at a rather open angle, gradually became stronger and assumed a more upright position (*g*) to (*h*) and became still more vertical from (*h*) to the terminal point.

Fig. 2, Granny Smith, is one of those which produces, naturally, leaders of more equal strength than the Jonathan and others. At the end of February, however, the two uppermost leaders, on the crown, were longer and stronger than the lower one. To remedy this defect

the terminal buds (*a*) and (*b*) were pinched out, in consequence of which, at the end of the period of growth, the leaders were all of equal strength and running at like angles to the vertical.

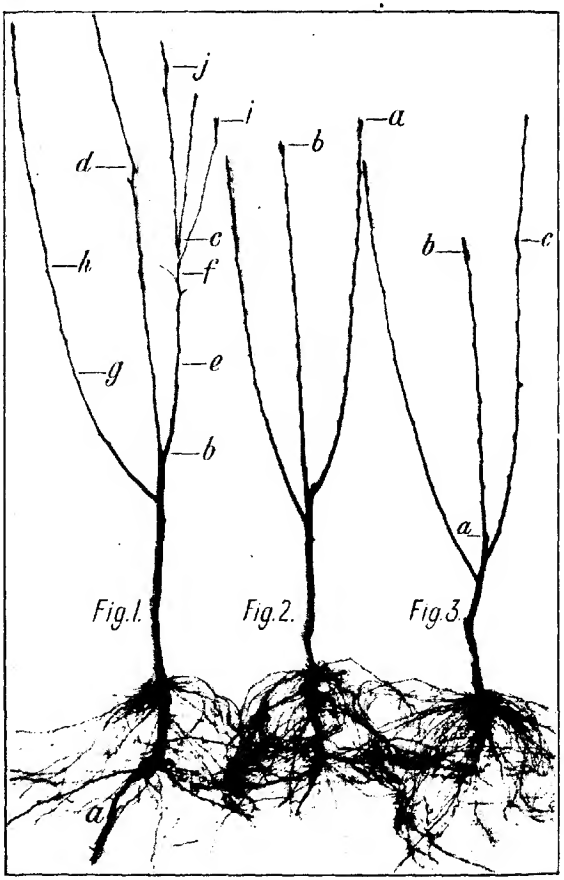

Plate 22.—Young Trees, First Year's Growth.

Fig. 3, Jonathan, is a weaker tree than Fig. 1. It, however, sent up a strong leader from (*a*), but when treated at (*b*) and (*c*) as described in connexion with Figs. 1 and 2, the foundation of a nicely-balanced branch system was the result.

Effect of Removing the Terminal Bud.

When the terminal bud on a young shoot is removed during the period of growth the wood ceases to extend in that direction, for some

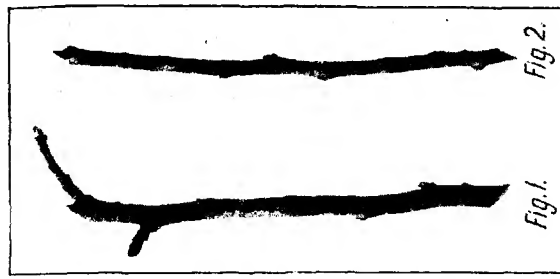

Plate 23.—Effect of Removing Terminal Bud.

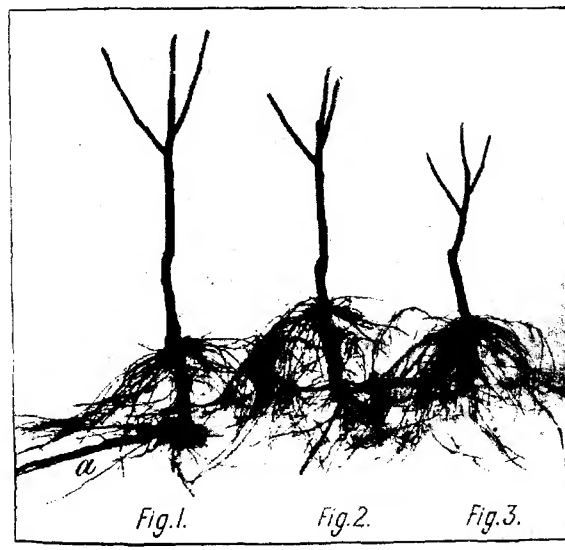

Plate 24.—Same Three Trees Pruned Second Year.

time at least. The leaves, which were produced below the position of the terminal bud, utilize their elaborated sap by strengthening the wood

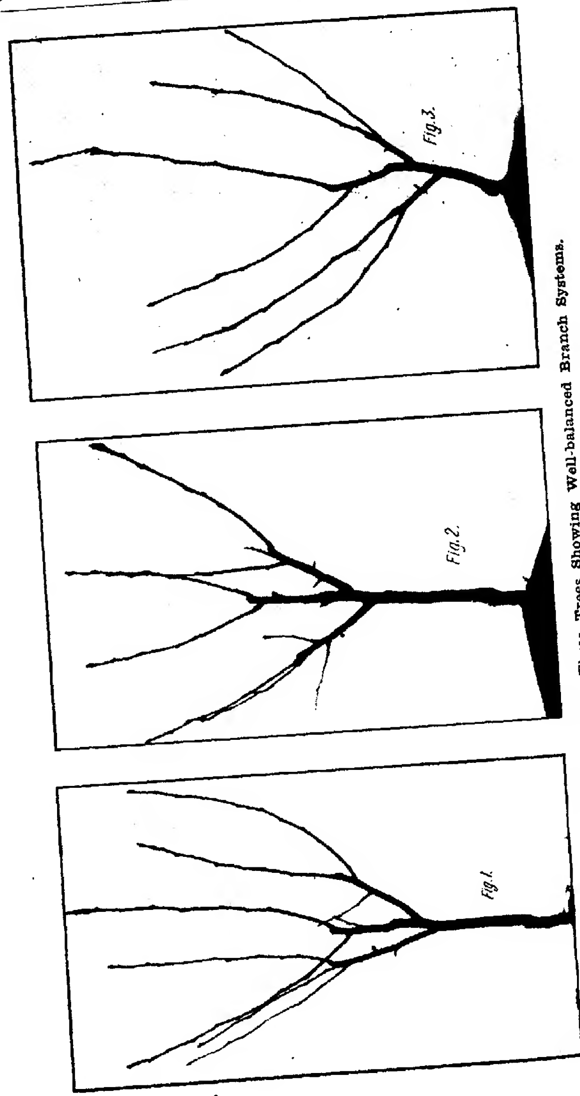

Plate 25.—Same Three Trees Showing Well-balanced Branch Systems.

often developed into blossom buds, before the young bud immediately below the position of the one removed commences to extend into wood growth. The nearest bud or two down the young shoot may perform similarly, according to the vigour in the tree and the time of disbudding.

Plate 23 illustrates this. Fig. 1 is enlarged section of wood taken from between (*e*) and (*f*) of the treated Jonathan leader in Plate 22, Fig. 1. This shows well-ripened wood and highly developed buds. Fig. 2 is taken from between (*g*) and (*h*) of the same tree. In this case the wood is not so strong, and the buds are weaker. This growth would have been still lighter had the other two leaders not been treated so as to assist it.

This matter will be further explained when summer pruning is being dealt with later on.

Pruning the Two-year-old Tree.

Plate 24 shows the same three trees in Plate 22, and illustrating method of cutting the two-year-old tree. Their leaders are cut back to side buds, about six inches from the crown, with the object of developing two main growths, in each case, on the yearling wood.

Fig. 1 is turned slightly around, to give a better view of the foot (*a*), the cause of the development of which has been previously explained. When photographed, the trees were again planted, with their roots unpruned.

Shapely Young Trees.

Plate 25 shows same trees one year older. The buds to which the cuts were made, as explained in connexion with Plate 24, responded, in every instance, by giving the two strong shoots desired. The shoots of Figs. 1 and 3, corresponding to those which produced the strong leaders during the previous year, were again inclined to offend similarly. But the swollen parts on these shoots indicate whence their terminal buds were removed and the equilibrium of the branch systems maintained.

Similar treatment of the offending leader on Fig. 2 kept it in order also.

By again cutting the young growths to buds corresponding with those to which they were pruned the previous year, sufficient leaders may be produced. Ten to twelve leaders are generally regarded sufficient for the root system to support on the class of soil usually favoured for apple growing, though where the grower practises heavy feeding of his trees it may be necessary to have more, providing provision is made for the free admission of light throughout the whole top.

(To be continued.)

POTATO CULTIVATION.

Cutting Seed and Rate of Seeding per Acre.

By J. T. Ramsay, Potato Expert.

The cutting of potatoes to be used for seed is essentially an economic question. In cases where only large tubers are available for planting the crop, it becomes necessary to subdivide these, in order that they may provide a greater number of sets, and so keep down the cost of seeding per acre.

In subdividing or cutting these, however, many growers go to extremes, and slice up the tubers into pieces which are too small. Where this is done, the crop is handicapped unduly at the outset.

Factors Governing Size of Sets.

The question may be asked—*What is the best sized set?* Before a direct answer can be given to this, several factors of environment have to be considered. The first of these is the vigor of the seed parcel. Seed of weak constitution will not stand as much cutting as seed which has been selected out of a healthy and prolific crop.

Undoubtedly one of the main reasons for varieties of potatoes so quickly degenerating to a level at which their cultivation ceases to be profitable, is the fact that practically no selection of seed is made, and the seed used is too severely mutilated by the cutting knife.

The second factor is the moisture content of the soil in which the seed has to be planted. Extremes of moisture and dryness are certain causes of "misses" when small cut sets are used. Therefore, unless the soil is in a nice condition of moisture, either whole or fair sized cut sets should be planted.

A third consideration is the fertility standard of the soil. If the fertility and physical condition be good, there is a lessened risk from the use of small cut sets.

Seed Cutting for Average Conditions.

The following comments and recommendations are based on the assumption that normally good potato land in a good state of tilth is to be planted, and that a parcel of potatoes made up of seed and ware sizes is available for the planting. When commencing to cut the seed it should be borne in mind that, within reasonable limits, the weight of the crop is proportionate to the weight of the seed used.

The fundamental reason for this is that the shoot or shoots produced from the seed set are in the first stages of growth entirely dependent on the nourishment they derive from the seed set. That being so, it is obvious that the larger sets can give a better start to the crop than can the small sets, simply because they contain a greater amount of the essential nourishment for the first growths.

Intense Propagation.

Under exceptionally favorable soil conditions, good crops have been grown from sprouts which have been removed from the tubers, but this

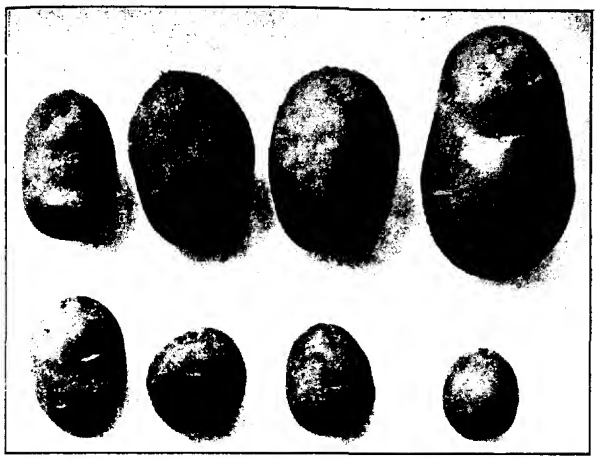

Fig. 1.—Average Variation in Size of Tubers in Ordinary Seed Parcel.

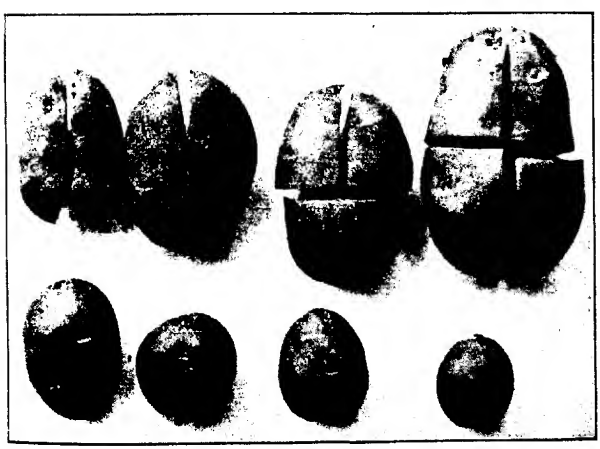

Fig. 2.—Method of Cutting Tubers Over Whole Seed Size.

degree of culture is not feasible in ordinary farm practice, and it is questionable if the prolificacy of a variety so treated would not be rapidly impaired by this method.

Method of Cutting and Size of Sets.

Fig. 1 illustrates eight seed tubers, the respective weights of which, commencing with the largest, are 9 ozs., 6 ozs., 5 ozs., 3 ozs., 2½ ozs., 1¾ oz., 1½ oz., 1¼ oz.

These are taken as being typical samples of variations in size found in the average seed parcel.

In cutting these for planting it is recommended that this be done as illustrated in Fig. 2.

It will be noted that no subdivision is made, and none is advised, of tubers under 3 ozs. in weight.

The subdivision shown results as follows:—

The 9 ozs. tuber ÷ 4 gives four sets averaging 2¼ ozs.
6 ozs. tuber ÷ 3 gives three sets averaging 2 ozs.
5 ozs. tuber ÷ 2 gives two sets averaging 2½ ozs.
3 ozs. tuber ÷ 2 gives two sets averaging 1½ ozs.

Cutting to smaller sizes than these is likely to prove false economy. The remaining tubers under 3 ozs. should be planted whole.

Under no circumstances should tubers of less than 1¼ oz. be used as seed for a field crop; in fact, seed of less than 1½ oz. weight should not be used if the soil and the seed are not in the best of condition.

In cutting large tubers, care should be taken—

First, that at least one good eye is left on each section.
Second, that the sections cut be as uniform in weight as possible and not less than 1½ oz. in weight.
Third, that portions showing weak buds are discarded.

Desprouting a Mistake.

A fairly common practice of some growers is to rub off all sprouts which may be growing from the tubers at the time of planting. This is a certain error.

By doing so, the seed tubers are set back some weeks in their growth, and are devitalized to the extent of the nourishment which they expended in producing the destroyed shoots.

It may be contended that the shoots are sometimes too long to permit the tubers being handled without breaking them.

If the tubers have long shoots growing from them, they are merely giving ocular demonstration that the grower's system of storage is very much at fault, and should urge him to the adoption of the system of storing his seed in proper seed potato boxes. These boxes have been described frequently in the columns of this journal and the press organs of the State.

Desprouting means devitalizing. That is beyond argument.

Fig. 3 illustrates tubers which have been allowed to exhaust themselves through over-sprouting. It is obvious that seed in the condition

shown could not be handled at planting time without breaking off the excessive growths produced by them. If these sprouts were removed, the shrivelled tubers could not again produce vigorous shoots, because their store of nourishment has been almost depleted.

This, of course, is an exaggerated case, but it serves to show how the vigour of seed potatoes is impaired by faulty storage conditions, conditions which force the sprouting of the tubers to such an extent that desprouting becomes a necessity. Storage of seed in seed potato boxes

Fig. 3.—Potatoes with Shoots too far Advanced. Due to insufficiency of ventilation and light during storage period.

eliminates a difficulty of this kind, and improves the power of reproduction of the seed so treated.

Time to Cut.

It is advisable that seed, when cut, should be planted in the ground as soon as possible. It is courting failure to cut seed and store it for some days before planting. The results of hundreds of tests prove that seed planted on the same day as that on which it is cut gives the heavier yield.

Drying the Cut Seed.

The dusting of lime, ashes, or sulphur on the seed to dry the wound caused by cutting is not necessary, as the ruptured cells quickly dry on exposure to the air.

Sulphuring at this stage may have some advantage, on account of it being fungicidal in its action, but it cannot, in this capacity, be as effective as spraying the growing crop.

Viability of Various Portions of Tubers.

Provided that the tubers used for seeding are normally healthy, and are cut to pieces of equal weight—no section of the potato has superior vigour to another, *i.e.*, stem ends and terminals are of equal value, weight for weight. The number of eyes on each set is of minor importance—it is the size of the set which counts.

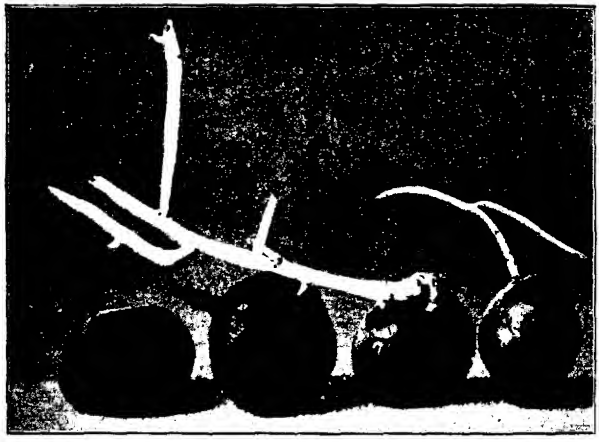

Fig. 4.—Evidence of the Advantage of Boxed Seed. Note perfect condition of the two specimens of boxed tubers (on left.)

Weight of Seed per Acre.

This, obviously, depends on the individual weight of the sets and the distance at which they are planted. For general practice, the spacing recommended by this Department is 27 inches between the rows and about 15 inches between the sets in the rows. If planting is done at these distances, and two ounces is the average weight of the sets, approximately 17 cwt. of seed per acre will be required for planting.

This is not a bit too much. The experience of specializing potato-growers goes to prove that it is sound business policy to use fairly heavy ratings of seed per acre, and to manure liberally.

Eugene Grubb, who acted as Special Commissioner to Europe in Potato Investigation for the United States of America Government, in summarizing his data obtained in the foremost potato districts of the world, states:—"The practice of successful growers indicates the best policy to be—

High fertility of soil.
Close planting.
Heavy rate of seeding per acre."

These elements of success in potato growing are within the control of the Victorian farmer, and until growers adopt improved methods of dealing with the crop, the average production per acre for the State (under three tons) will continue to be an unpleasant reflection.

It is of greater moment that the acres at present cultivated should be made to produce more, than it is that more acres should be brought under cultivation.

The former would mean a really progressive increase in the State's production—while the latter (with present-day farming standards) would only increase the magnitude of current mediocrity.

SULPHATE OF AMMONIA AS A FERTILIZER.

Special reference is given to the use of sulphate of ammonia as a fertilizing agent for various crops, in a pamphlet recently issued by the Department of Agriculture of Leeds University, England. The supplies of sodium nitrate not being available this year, farmers must rely on sulphate of ammonia for nitrogenous manure.

Experiments have been conducted in the East and West Ridings of Yorkshire on land varying in character. In the case of barley, the yield was increased from $3\frac{3}{4}$ bushels per acre to $7\frac{1}{2}$ bushels by a moderate application of sulphate of ammonia. The effect on oats was more marked, the increase in one case being $9\frac{1}{4}$ bushels of grain and $4\frac{1}{2}$ cwt. of straw per acre. For potatoes, sulphate of ammonia has been in great favour.

In the case of turnips, it was found, as a result of 44 trials over a period of eight years, that an application of $\frac{1}{2}$ cwt. of ammonia sulphate, in addition to dung and superphosphate, increased the yield of swedes by 12 cwt., while a dressing of 130 lbs. gave an average increase, over four years, of $6\frac{3}{4}$ cwts. per acre in the case of meadow hay.

—Extract *Journal Industrial and Engineering Chemistry*, June, 1916.

Very little of the simple manure ammonium sulphate is used in Victoria. A large percentage of the amount manufactured is exported.

On small holdings in mixed farm areas in the southern portion of the State, in the midland districts, ammonium sulphate used in conjunction with other manures is well worthy of trial.

Departmental experiments in the case of potatoes produced increased yields.

MEAT PRESERVATION ON THE FARM.

By J. C. Marshall, Stock Inspector.

In the warm months of the year there is often considerable waste of meat where animals have to be slaughtered for farm use. To minimize this loss prompts the writer to offer a few suggestions and methods to assist in the economical handling and preservation of meat on the farm.

Be it beef, veal, mutton, or pork that is required, at least one animal has to be slaughtered, and if it cannot be all used in the fresh state, there is considerable loss and waste with the remainder.

It may be said that from the time the knife is stuck into the animal, putrefaction begins, and the length of time the carcass will remain fresh depends, especially in the hot weather, mainly on its treatment after slaughter.

If possible, the animal should be killed on a cool clear day, and if in the warmer months, the cool of the evening is the best time. The animal should be well bled, and heavy beasts immediately after slaughter split down. Remove all internal flear and fat, including kidney fat. This facilitates the cooling, and allows the animal heat to escape. Generally speaking, the carcass should not be cut up until it has thoroughly cooled, and the following morning is the best time after slaughter overnight.

Clean utensils are absolutely necessary in dressing the carcass, and if it be required to wash away any blood or other stains, see that both water and cloth are perfectly clean, and that as little moisture as possible is left on the carcass. In fact, it should be wiped dry.

The carcass should be hung in a clean, well-ventilated room, or preferably in the open air, where the atmosphere is clear and pure. In localities where flies are troublesome, it may be necessary immediately after slaughter to place the meat, broken up into suitable sizes, in fly-proof safes or cover with proper netting or suitable material. In any case, the carcass should be suspended in a clean, well-ventilated place. A large safe with the sides and door covered with hessian material, or thin blanketing in lieu of the wire gauze, and kept continuously wet from a sprinkler attached to a hose, is a very good cooler for outside use in hot weather, and it is fly-proof.

As a general rule, it is best that meat should be set before being cut up, but in exceptionally hot weather it may with advantage be cut up and some of it used immediately after slaughter, and in very bad weather even before the animal heat has escaped. The amount required *for immediate use—the portions ordinarily boiled* (necks and shanks of mutton or veal)—should be cooked straight away. If sufficiently cooked, it will be found to be almost as good, palatable, and tender as if allowed to stand the longer period. In the case of the rougher pieces such as necks, knuckles, and shins, and pieces left as the result of boning *(including bones), the soup derived therefrom will be better than* if made from portions allowed to remain, even if it be only for a few hours.

The balance of the carcass must be freed from bone and superfluous fat. Absolute cleanliness with hands, utensils, tools, and benches is imperative in the process, and according to the quantity of meat required it may be preserved. If the amount is small, say, enough for two or three days' supply, the simplest method is the sterilization process. This method will be explained later in process No. 3. Meats which cannot be utilized at time of, or soon after, slaughter, must be preserved until time of consumption.

There are various methods in vogue for the preservation of meats, and they may be grouped as follows:—

1.—Curing by salting or pickling.
2.—Treatment with chemicals.
3.—Sterilization by heat.
4.—Preservation by drying.

Curing by pickling methods has been practised from the earliest times, and the chief ingredients employed are salt, sugar, saltpetre, and wood smoke. With the necessary skill and knowledge, meat can be preserved by this means, and flavours retained and developed which are, as a general rule, palatable and in some cases give an additional value thereto. The nutritive value of the meat is slightly, if at all, diminished by the use of the preservative agents employed. Salting has a dehydrating effect, and to some extent hardens the meat tissues without interfering with the mellowing process, and it also prevents the development of putrefactive organisms. Saltpetre in small quantities gives the necessary pink colour, without being injurious; its preservative action is small, but it has the effect, however, of lowering the temperature of the brine somewhat.

Sugar is not a necessity in the meat pickling process, and is only used in conjunction with salt for meat preservation. It breaks down any hardness that may be caused by the salt and saltpetre, and develops in the meat a pleasant flavour. To pickled pork and ham it imparts a flavour appreciated by many.

Wood smoke has a preservative action on meat, and meat products, by its dehydrating and drying effect, also by the action of its volatile acids permeating to some extent the meat subjected to its influence. In some wood smokes, creosote, carbolic, pyroligneous and other preservative acids impart to the meat special flavours as well as acting as preservative agents. The maximum of smoke with the minimum of heat is the best mode of application. A large barrel, or even the large chimney of the farm kitchen, does in the absence of a smoke-house for the purpose.

1.—Salting or Pickling.

The most common method, and if properly conducted the most successful for farm use, is that known as salting or pickling (wet process).

Make a brine in a wooden vat or tub, after seeing that it is perfectly clean, in the following manner. Mix sufficient salt with the required amount of water until it will float an egg or potato. Boil the whole, and when cold add ¼ lb. saltpetre to every 10 gallons of brine. The meat

small joints. In the cooler weather the usual joint sizes can be adhered to. Pack the meat in layers after rubbing each piece with dry salt, cover with a board, and weight down under the brine. Sprinkle with a little fresh salt every day when changing the position of the meat. The brine tub should be located in a dark, cool place. A cellar is about the best situation, and this should be well ventilated, as if muggy and close, brine fermentation is set up. If any sign of fermentation appears in the brine, indicated by frothing and bubbling, remove all meat and wash in water which has been previously boiled, and to which a small quantity of salt has been added. To each gallon of wash add ¼ oz. of washing soda. This will check the action of fermentation bacilli. Boil the brine, adding more salt during the process of boiling, so as to bring it to the original strength. Dust a little salt on each piece of meat before replacing it in the cold brine. Pickle well made and kept up to its proper strength should keep for years. It is best to leave a little meat or a few bones in the pickle to carry it through the winter months, even when it is not required to corn much meat. This keeps the pickle right by acting as a feeder. Meat cured in this way is fit for use in from 24 hours. If it be necessary to leave meat in the brine for long periods, it should be well soaked in cold water before cooking, to remove surplus salt. On farms where pickling is the regular practice, and the quantity used merits it, a small brine pump would be an acquisition. This is a simple contrivance, easily worked, and by its use it would make doubly sure quick pickling in hot weather. The pump forces the brine throughout the meat tissues, and the centre of the meat is salted before it has time to go off. Brine pumps can be purchased for about 25s. upwards. Old matured sweet brine is the best for pumping purposes, and the needle of the pump inserted every 2 or 3 inches and a small amount of pickle injected. This is preferable to large spaces between the needle insertions, and a larger quantity of brine injected. Care must be taken in using the brine pump that the needle is always full of brine before inserting the needle into the meat, otherwise it will be air blown, and putrefaction rapidly result.

Dry Pickling.—Free the meat to be treated by this process from all bone, and cut into suitable sizes, much smaller in hot weather than in cold weather. The meat should be rubbed with salt and dusted with a little finely-ground saltpetre. The proportion is 50 parts salt to 1 saltpetre. There will be a certain amount of natural brine formed, and this may be poured over the meat. It is imperative that the best quality of salt shall be used, and a mixture of equal parts of fine and coarse salts will be found the most efficacious. Pack the meat in barrels or a clean wooden receptacle in a cool, well-ventilated place as recommended in the case of wet pickling. It is claimed by many that the addition of a little sugar improves the flavour, but as sugar is likely to induce fermentation, it could only be used during the cooler months of the year. In the hotter portions of the State during the summer months, instead of packing the dry-salted meat away in cellars, hanging the meat in a wet bag in a good draught has proved successful. Let water drop continuously on the bag from a cistern arranged above the bags. A wet hessian safe, sometimes known as a "Coolgardie" safe, is a good place to store dry-salted meat in the very bad weather.

Smoking.—If required, some of the salted meat may be subjected to further treatment by smoking. In the case of beef, certain parts, such as boned brisket, can be tied with stout string into rolls and smoked. Corned legs of mutton should be dusted with pea meal and smoked into mutton hams. Smoked corned ox tongues keep well, and the flavour is preferred by many. After salting, the meat to be smoked should be washed free of salt, hung up to dry, then placed in the smoke-house and subjected to a cool smoke for from two to three days. A smoke can be made by lighting a small wood fire in the smoke-house and covering it lightly with sawdust. Place most of the sawdust in a circle round the fire. See that the fire does not again spring into flame, but that the sawdust goes on smouldering.

2.—Treatment with Chemicals.

The practice of preserving meat with chemical agents is a recent innovation in the curing of meat, and came into use within the last thirty years. For preserving meat for sale, it is now prohibited, as far as this State is concerned, by the introduction of the Pure Foods Act. It is generally conceded the preservation of meat by means of chemicals, though effective, is more or less dangerous, and should not be practised where other processes can be substituted. Meats preserved by the aid of chemicals when consumed are harmful to the human subject. In the very hot weather, the addition of a little borie acid to the pickle in salting meat may be advantageous. Chemical preservation of meat for farm use is not recommended.

3.—Sterilization by Heat.

Of the methods suggested sterilization, although perhaps requiring a little extra care, is the least objectionable, and when properly conducted, safest for meat preservation in the fresh state. The raw meat must be free from disease and obtained under sanitary conditions, and handled cleanly until sterilization is affected, and this must be done before any fermentation or decay can possibly take place.

Method.—(*a*) Reduce the size of the meat to be treated to not larger than about 6-in. cubes, and it should be as uniform in size as possible. Place meat in a boiler that has a tight-fitting lid, add a little salt, and sufficient boiling water to cover. Boil from ½ to ¾ hour. Then add about a pint of rendered fresh mutton fat. Replace lid and again boil for a few minutes. Remove boiler to a cool place without disturbing lid till meat is required for use. Every time meat is taken out of boiler for complete cooking, the boiler should be replaced on fire and boiled up for about 15 minutes. Again place boiler in cool place. Rapid cooling is a feature in the success of this process.

In the absence of proper boilers a clean petrol or kerosene tin can be substituted. The meat should be boiled in this receptacle for about ½ to ¾ hour, and a good coating of rendered fresh mutton fat poured on while hot. Remove to cool place, where the fat will crust above the meat. Every time fatty crust is broken again boil up for 15 minutes.

Some of the better quality cuts may be roasted in the ordinary way and while still hot dropped into the petrol tin containing the fresh

rendered mutton fat. See that meat is completely covered in fat, and remove to the coolest spot available. Quick cooling contributes largely to the success of this process.

(*b*) Another process is to cut pieces of meat into suitable sizes free from fat and parboil them. They are then dipped into liquid gelatine at a temperature of about 140 deg. Fahr., and thick enough to leave a good coat on the meat. The pieces treated should be removed to a cool place, and when thoroughly dry packed away with sawdust in suitable receptacles.

(*c*) It is possible to preserve freshly-killed meat with the aid of powdered charcoal by cutting the meat into suitable sizes and packing away in a suitable wooden receptacle, such as a clean packing case. Starting with 2 inches of powdered charcoal on the bottom, and alternating the layers of meat and charcoal, and finally covering the top layer with the powder. Stow away in a cool place. The preservative action of charcoal is well known, and is due to its absorptive properties and its affinity for oxygen. It prevents the entrance of oxygen to the meat. There are also preservative agents such as creosol in the charcoal. The meat can be washed free from powder and cooked in the ordinary way as required.

4.—Preservation by Drying.

The flesh of animals used for human consumption has a high water content averaging, according to condition of animal, from 50 per cent. to 75 per cent., and by removing the bulk of the moisture from the meat the keeping property is enhanced, so much so that if it be completely dried, it will keep for very long periods. It has been shown that salt preserves meat by its drying effect. This dehydrating effect can also be obtained by the application of heat. Under suitable conditions the drying can be done in the open air by natural heat. In most cases it is unnecessary to evaporate the whole of the water present. The quantity extracted will depend on the length of time it is required to keep the meat. Dried meat is unattractive in appearance, but little of its nutrition is sacrificed. Boiling is the best mode of cooking. Beef and veal are the best meats to be treated by this method.

(*a*) Free the meat from bone, sinew, blood-vessels, and fat, cut into thin slices, and hang in the dry hot air and sunlight till hard and dry. Then pack away till required.

(*b*) Cut meat into thin slices and free from fat, sinew, and veins, then rub thoroughly with a little of the following mixture. Salt, 4 lbs.; saltpetre, 5 ozs.; black pepper, 5 ozs. Hang in hot dry air and sunlight till dry. Pack away with sawdust in cool place.

(*c*) Free from fat, sinews, and veins, and put meat through a mincer and dry in hot air or over a mild fire on an iron tray. Temperature not to exceed 140° Fahr. The meat will dry out rapidly, when it can be powdered and stored in airtight tins or bottles for future use. For making soup and gravies it has proved suitable, and is known as Dry Powdered Meat.

As previously mentioned, meat to be successfully preserved must be treated, especially in the hot weather, within a few hours after slaughter. Success is not to be looked for if flesh is allowed to hang about for any length of time before treatment. If, for instance, on a small farm, in the hot weather, a sheep is slaughtered and the requirement is about one-third for a day, unless a cool change sets in the portion unused on day of slaughter will probably be wasted unless it is preserved by one of the methods suggested.

BLUE MOULD IN TOBACCO PLANTS.

The following treatments of the soil to prevent root rot and other fungoid diseases, as experienced in America, are well worthy of a trial in Victoria for blue mould, and particularly so for late beds, when the earlier sowings have failed. Tobacco plants can be raised from seed sown as late as the first week in November, in time for late December planting, provided they are grown in cold frames, *i.e.*, the beds enclosed with boards 12 inches high all round, and covered with cheese cloth or coarse hessian. This system maintains a more uniform temperature, conserves moisture, and obviates the risk of infection from outside sources.

The plants should be exposed for a couple of days to the sun before transplanting to harden them.

—Temple A. J. Smith, Tobacco Expert.

TREATMENT OF TOBACCO PLANT BEDS.

(*By A. D. Selby, True Houser, and J. G. Humbert, of The Ohio Agricultural Experiment Station*).

While the root-rot fungus was first examined from certain Clermont County plant beds in 1899, it has not often seemed a serious disease in the Miami Valley District. It was certainly serious in the plant beds during the season of 1915; this root-rot continuing to cause serious losses after the plants were set in the field. In certain soils of the water-holding types, like the soils of the South-Western Test Farm, Germantown, the tobacco crop was little, if any, more than one-third the normal average. This agrees with the experience of others in wet seasons. The work heretofore done upon this disease by Gilbert* and others, has shown the many-sided nature of the problem.

Experiments show that the root-rot fungus may be thoroughly killed out of old plant beds by either of two tried methods of disinfection applied to the soil, viz.:—(1) By steaming the soil, preferably by use of the inverted pan method. (2) by means of formaldehyde (or formalin) drench upon the prepared soil of the bed.

It is to be noted—

(*a*) that no one will care to extend his losses from root-rot into another season, if avoidable;

(*b*) That the root-rot fungus will survive in the soil, as in old plant beds, where it prevailed in 1915. It may survive in fields as well.

Having the whole situation before us, it seems wise to kill the root-rot fungus out of plant-bed soil through sterilization by steam or formaldehyde. Either of these may be applied before winter begins, if that is so preferred. It is clear that healthy plants are essential to a successful tobacco crop. First attention to growing sound plants is accordingly advised.

* Gilbert, W. W., Bul. Bureau of Plant Industry, U.S. Department of Agriculture, 158 : 1909.

FALL TREATMENT OF SOILS FOR PLANT BEDS PRACTICABLE.

In spring the soil is liable to be full of water, and better conditions for bed spading and preparation may occur in late fall, besides avoiding the delay in seeding which is often objectionable in spring treatment. When fall treatment is practised it will not be necessary to re-spade the bed in spring, preparatory to seeding; only the surface need be worked. The object of such treatment is to destroy the forms of the root-rot fungus or other species, such as bed-rot, &c., which otherwise live over in the beds where the disease occurred in 1915. Because the "Thielavia" is found upon numerous other host plants it is not clear that new bed locations will avoid the necessity for treating the soil. For the present it is not expected to discuss and list the plants attacked; rather to prepare a method whereby healthy tobacco plants may be produced for setting in the field.

PREPARATION OF SOIL TO BE TREATED.

Previous to treatment by any method, the soil should be prepared much after the manner of preparation for seed-sowing. If manure is to be applied to the bed area, make such application in advance. When chemical fertilizers are to be used, their application need not be made until spring, just before sowing seed. The soil to be treated is taken in good workable condition, certainly not over-wet, spaded to the necessary depth, and thus handled in a preparatory manner. Very dry soils have not been found satisfactory. There seems to be no need to rake over the spaded soil beyond that necessary to fine it enough to facilitate penetration of the drench or steam.

STEAM STERILIZATION BY INVERTED PAN.

The apparatus necessary for steaming consists of an inverted pan made of galvanized iron, having nipple attached for steam hose, which is to connect the pan with a boiler of 8 to 12 H.P. capacity; the ordinary traction engine has proved serviceable in furnishing steam. A pan which will fit the usual plant bed, namely, 5 ft. 6 in. by 8 ft. 6 in. by 7 in. deep, is advised. This is to be made of heavy galvanized sheet iron, preferably rust-proof, of 18, 20, or 22 gauge. These metal sheets, ranging in size from 2 to 3 feet wide by 8 to 10 feet long, are seamed, riveted, and braced by strap and angle iron for stiffening the pan. Four or five sheets will be necessary.

After the soil is prepared the pan is inverted over a part of the bed, with edges pressed down into the soil so as to form a steam-tight air chamber. Steam is then turned on from the generating boiler under 50 lbs. to 80 lbs. boiler pressure. At this pressure it will sometimes be found necessary to weight down the pan to keep it from lifting. Each area requires to be steamed approximately one hour. After removing the pan to adjacent part of bed, the soil is to be tested with a thermometer, and should register 180 to 210 deg. F. at a depth of 3 to 6 inches. If this temperature has not been attained, increase the steaming period by 10 to 15 minutes.

BED DRENCHING WITH FORMALDEHYDE.

It is more convenient to drench the soil of the plant beds with a solution of formaldehyde (formalin), as only a sprinkling pot with hose will be required in addition to the chemical. However, previous experience fails to show equal effectiveness in complete killing out of the plant-bed fungi.

The strength of solution to be most successful probably should be stronger than that heretofore suggested, and the amount of solution applied may prove to be less with the stronger formula. The proportion of one gallon of formaldehyde to 50 gallons of water, and the application of one-half gallon per square foot of surface, has been suggested by Johnson in treatment of plant beds for a different fungus "Pythium." This may prove to be successful for the root-rot. For the present a strength of one gallon of formaldehyde to 100 gallons of water is promising. Of this weaker solution the total application should amount to three-fourths of a gallon to one gallon per square foot covered. In the application, the solution should be applied as evenly as possible to avoid waste, and at two or more applications. In all cases, effectiveness is gained by covering the plant-beds with canvas to prevent escape of fumes. Before applying the solution, the beds should be fairly moist and friable. If locally too dry an unevenness will show in the results of treatment. Even penetration of all the soil is the aim.

ADVANTAGES AND DISADVANTAGES OF STEAMING AND DRENCHING.

The relative advantages of steaming compared with formalin drenching are largely in the more certain effectiveness and thoroughness of the steaming, together with the killing out of weed seeds in the plant-beds, thus saving subsequent cost of weeding. Perhaps yet another advantage of the steaming is that it brings tobacco growers to realize that a real problem is to be met, not an invention of the mind, and that foresight in preparation and treatment are required. Further, it will probably be found that the heavy soils of the uplands will not be easily penetrated by the formalin drench. On the other hand, the gravelly soils of the valley districts will be likely to respond quite satisfactorily to the drenching method.

This circular has been prepared to give timely advice to those expecting to grow tobacco crops in 1916. It does not cover the problems relating to the possible presence of the root-rot fungus in the soil where the crop is to be grown, but this problem may be left for the present, since it is impossible to grow a good crop without growing a healthy supply of plants. It is hoped, upon further investigation, to supply additional information regarding the root-rot problem in tobacco fields. It is urged that growers group themselves together and co-operate in the treatment work. This co-operation may apply in the combined purchase of an inverted pan for steaming the beds of a group of growers, or if the formalin drench method is used, in the purchase of formaldehyde in carboy lots.

Do not sow seeds too deeply, as many crops fail on this account.

Do not apply rank manure to soil in which tap-rooted vegetables, such as beet-roots or parsnips, are to be grown.

It was a far-seeing man who wrote long ago:—"Some day thou shalt know by experience how sad a path it is to be dependent on others."

It is on rich soils that artificial fertilizers, judiciously used in conjunction and supplementing farmyard manures, produce the most profitable results.

Official figures state that there are in the United States 21,262,000 milch cows, 37,067,000 beef cattle, 49,956,000 sheep, 64,618,000 pigs, and 21,195,000 horses.

Those farmers not already possessing power would do well to now install a suitable oil engine. These work cheaply, and save both time and hand and horse labour.

Do not forget that crops of peas, beans, onions, carrots, and many others are greatly benefited by light dressing of soot, fowl manure, or nitrate of soda during showery weather.

Barley is selling in Scotland at a figure that is not within the recollection of the proverbial oldest inhabitant. As much as 6s. 5d., 6s. 6d., and 6s. 7d. per bushel is being paid for the best samples for distilling purposes.

A good preparation of the soil is one of the most important elements of success in the introduction of crops. The finer the condition of the soil, the better is the crop able to extract its nourishment.

It has been calculated that the stoppage of fodder imports into Germany will involve a decrease in the supply of meat by one-half. The mailed fist of the British Navy is hitting the German Empire!

No food is so cheap nor so effective in the feeding of deep-milking cattle as good pasture. It is only when the pasture is of poor feeding quality, is dried up, or is of too rank a growth that supplementary fodder is required.

INSECT PESTS OF THE FRUIT, FLOWER, AND VEGETABLE GARDEN.

AND HOW TO TREAT THEM.

By C. French, Jnr., Government Entomologist.

(Continued from page 498.)

The Metallic Tomato Fly.

This pest is a very handsome fly, belonging to the real "fruit flies." It is of a metallic, bluish-green colour, and less than half the size of the common house fly. The eyes are very large and prominent, and the body somewhat short and plump for the size of the insect. The larvæ are about the size and shape of the common blow-fly, and as many as eight have been found in one tomato. This insect, so far as can be ascertained, is an importation from New South Wales, and has spread to all parts of Australia. It has been stated that it will only attack fruits, &c., when they are either nearly ripe or have been bruised in some way. In Victoria, our experience is that it will tackle fruit, especially tomatoes, upon which no bruises of any kind can be detected, even with the aid of a good magnifying glass. It is giving no end of trouble where tomatoes are grown extensively, and many cases which were thought to have been attributable to the fruit fly have been traced to the depredations of this tiny insect. Spraying with quassia chips and benzole emulsion as a preventive has given good results. Smudge fires, as used against the Rutherglen bug, would, no doubt, keep these flies from tomatoes that are ripening. When tomatoes,

Fig. 20.—Metallic Tomato Fly (*Lonchæa splendida*).

&c., are found to be affected with the grub of this fly, no time should be lost, and all infected fruit should be gathered up and boiled.

Tiger Moths.

The dark-striped tiger moth and the light-striped tiger moth are two native moths, which, in the caterpillar state, are very destructive to all kinds of plants—dahlias, carnations, sweet peas, pelargoniums, &c., and all kinds of vegetables, especially beans, are destroyed by them. The caterpillars are hairy, and may frequently be seen in large numbers. As a rule, birds do not seem to be partial to these insects. The eggs are often deposited amongst weeds on neglected headlands. When hatched, the young feed ravenously. The cocoons are deposited near the tussocks, and are partly covered with grass. The larvæ feed mostly by night, and hide by day. As this pest threatens to become a serious one, prompt action must be at once taken to stamp it out. Excellent results can be obtained from the arsenate of lead spray. This spray mixture is cheap, and there is no difficulty in mixing it. The arsenate of lead is placed in the pump, the water added, the nozzle of the pump placed inside the pump, and the mixture of arsenate of lead and water forced through the nozzle for a few minutes till the mixture is complete. In motor pumps, the agitator in the pump mixes the material.

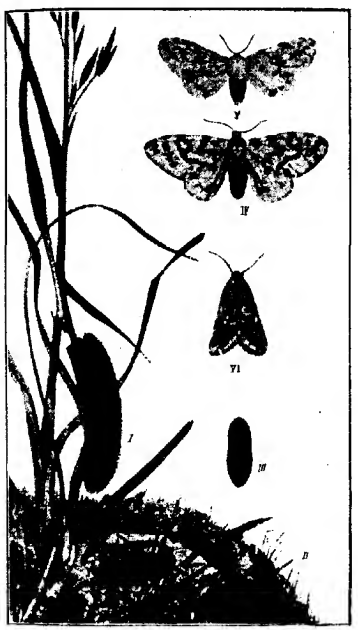

Fig. 21.—Dark-striped Tiger Moth
(*Diacrisia canescens*, Le G.).

Light-striped Tiger Moth
(*Artices glatignyi*, Butler).

Thrips.

The minute insects known as thrips are among the most notoriously injurious pests to cereals and other plants—such as roses, dahlias, carnations, tomatoes, beans, onions—known. They are difficult to deal with, on account of their habit of crawling into the centre of the flowers of roses, fruit trees, raspberries, &c., and sucking the juices out of the petals. This causes them to turn a dirty-brown colour. In some

instances, they die before the fruit is formed. Thrips are minute insects, seldom exceeding a line in length. The eggs are extremely small, cylindrical, and round at one end. From them issue little larvæ quite as active as their parents. When the insects are fully grown, their wings are long, narrow, and lie flat on their back when at rest. They are surrounded with ciliae, or hairs, giving them the appearance of tassels. The species under notice is an introduction from Europe, and has long been known in England and elsewhere as one of the gardener's worst enemies. The life cycle of these insects is as follows:—Development of egg, 10 days; development of larva, 30 days; development of nymph, 7 days; total, 47 days. During the past few years these troublesome insects have been very severe on potato crops in many parts of the State, and Mr. G. Seymour, the former potato expert of the Department, estimated one season's loss at several thousand pounds. The thrips question is even now a very serious one, as so large a number of plants are subject to its attack, and no one knows where the trouble is going to end. It behoves all growers to look this trouble square in the face, and, if possible, to keep it within reasonable bounds. When the fruit trees are in bud is the time for an occasional spraying. Various remedies have been tried, the best of which is as follows:—Benzole emulsion. This is a patent preparation, which can be obtained from any seedsman in Melbourne. The cost per tin is only a few pence. One tinful (1 lb.), when diluted, makes 5 gallons of spray. If this is sprayed on the flowers it acts as a deterrent. Fruit-growers in the Beaconsfield District, on my suggestion, used this material, and they report good results. As a deterrent, spraying with tar-impregnated water, or a weak kerosene emulsion, is recommended. The following is the formula for coal-tar water.—Boil 1 lb. coal tar in 2 gallons of rain water, and while hot add from 50 to 100 gallons of water. Nicotine, lime sulphur, hellebore, and quassia sprays have also given good results. Pine Spray, a patent preparation, has also been used with success against these pests. I would suggest that, when an orchard is badly

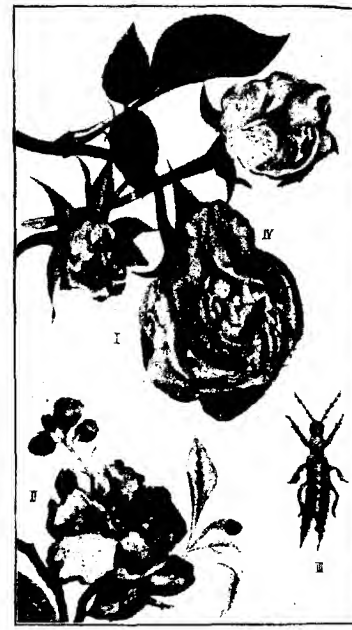

Fig. 22.—Common Thrips (*Thrips tabaci*. Lindemann).

attacked by thrips, smudge fires, as recommended against Rutherglen bugs and cherry green beetles, be tried.

Tomato Weevil.

This is a native insect, which has become a serious pest to persons growing tomatoes and other vegetables, and also garden plants. The

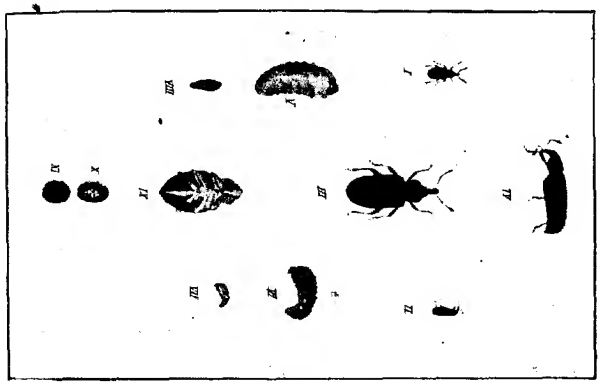

Fig. 23.—Tomato Weevil (*Desiantha nucea*, Lea).

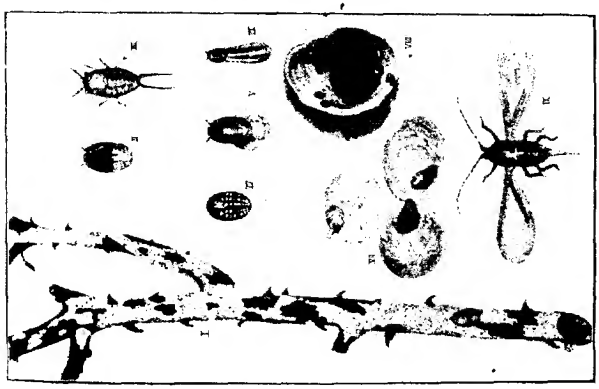

Fig. 24.—Rose and Raspberry Scale (*Diaspis rosæ*, Sandberg).

larva of this insect is greenish in colour, and measures about $\frac{1}{4}$ inch in length. It is usually found in the soil a few inches below the surface, where it conceals itself in the day time, and at night comes out to feed. It devours the whole plant very rapidly. One grower, residing near Essendon, informed me that he lost eighty fine tomato

plants in one night, and that on one evening alone he collected no less than 638 of these weevils. The perfect insect measures about ¼ inch in length, greyish or dark-brown in colour, with a somewhat V-shaped marking on the wing-cases. Many experiments have been carried out for the destruction of these insects, and the arsenate of lead has given the best results. Another good plan, which has been tried with much success, is the placing of pieces of newspaper under the leaves of the plants at night, and for the grower to go out at intervals with a light; the beetles, startled by the light, immediately fall into the paper, and may then be destroyed.

Rose and Raspberry Scale.

White scale infests roses and other plants belonging to the same order. On some plants the scales are so thickly clustered that the stems look as if they had been whitewashed. The female insect is protected by a circular, hard covering. On removing it, hundreds of young scales will be noticed. These, shortly after being hatched, commence to suck the juices from the plants, which causes them to become sickly, and if not attended to will die. The following remedies will prove effectual:—Prepared red oil This should be used after pruning, or, better still, before pruning, as pieces of the prunings are often left on the ground, and the young scales will leave them and go back to the old plants. Kerosene or benzole emulsion could also be used. Scrubbing the stems of the rose plants with a scrubbing or other hard brush dipped in soapy water, to which is added a little kerosene, is effectual in ridding the plants of this scale.

The Gum Scale.

This is one of the commonest scales in South Australia. It is generally found on young eucalypts, but is often found on other tall trees also. Fortunately, it is rarely found on fruit trees; only one instance, as far as I know, of its having been found on apple trees, is recorded. The larvæ vary in colour from yellow to light red, and when hatched, crawl all over the twigs. The fully-grown female scale is enclosed in a rounded, cotton-like sac, being in colour from creamy white to yellow, sometimes dull red; these scales are attached to the twigs, and so closely are they packed together that, in some instances, it is impossible to see the stems or twigs to which they are attached. Sugar and mahogany gums in gardens and plantations near Melbourne are often attacked by these insects. Ladybirds, and the scale-destroying moths, help to keep this pest in check. In New Zealand, this scale was very bad in the plantations. A consignment of ladybird beetles was sent over and liberated, and in a very short time most of the scales were killed by these useful insects. As a means of keeping it in check, the red spraying oil, sprayed on the trees in summer, has given splendid results. Kerosene emulsion is also recommended.

The Vine Scale.

This is an introduced species, being common in England and elsewhere, and causing no end of damage to plants. It is probably the

largest of the hard-shelled scales, and it is spreading in Victoria, and is doing considerable damage, especially to young vines. There is no doubt that this scale is on the increase; but, as it is so large, it is easily seen, and steps can be at once taken for its eradication. If the scales are removed, hundreds of minute eggs are seen; when these hatch, the young at once commence to suck the juices from the plants, causing

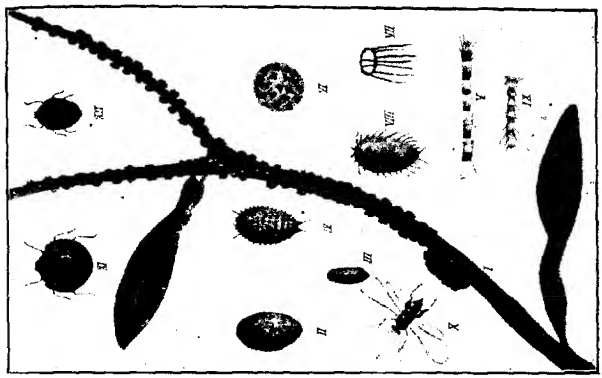

Fig. 25.—The Gum Scale (*Eriococcus coriaceus*, Maskell).

Fig. 26.—The Vine Scale (*Lecanium berberidis*, Sch.).

them to become a sickly colour, and often shrivel up. A good plan is to rub the adult scales off the affected plants with a scrubbing brush, the eggs will then fall to the ground and perish, or be carried away by ants and other insects. Scrape off all old, loose bark from vines, as these insects hide under it. Unfortunately, it has recently been found

on plums, apricots, and other trees, also on garden plants, principally fuchsias and pelargoniums. If the plants are sprayed with red oil or benzole emulsion the scales soon disappear.

The Rose Aphis.

This destructive insect is well known. The family of aphidæ contains many species or varieties. Nearly every plant has its own particular aphis. They are all minute, soft-bodied, and generally long-legged. The mouth is furnished with a curiously constructed beak for sucking the juices of the plants. The life-history of these insects is very complex. The winter eggs, or larvæ, lie dormant during the cold in crevices in the trunks, or hidden underground on the roots of the host plants. As the warm weather approaches, they crawl up the trunks, cluster round the leaf-buds, and, sticking their sharp beaks into the tissue, suck the sap. They give birth to larvæ, which grow rapidly, and in turn (through virgin females) bring forth fresh broods of live larvæ, which, in the course of several generations, develop two pairs of large, transparent wings. The aphides are usually of both sexes, though in some species the males are wanting. The last generation flies away in swarms. Before dying, the insects deposit eggs, which carry on the cycle of their life into the next summer. The following sprays have been tried with good results, viz.:—Tobacco-water. Quassia-water (soak 1 lb. quassia chips in 1 gallon of cold water overnight, and boil gently for four hours. Strain off the chips, and dissolve ½ lb. of soft soap in the solution. This will make 10 gallons of spray). Benzole emulsion, surpazol, Niqua's pine spray, and red oil (used after pruning is absolutely the best spray for these insects) are also recommended.

The Apple-Root Borer.*

This weevil is a native insect which formerly infested wattles (acacias), but has now forsaken its natural food, and is one of the worst insect pests orchardists, vignerons, and others have to deal with, on account of the grubs or larvæ living deep in the soil and in the roots of apples, vines, &c. The perfect insect is usually of a light-grey colour, but is a variable species, sometimes the colour being a brownish-grey. The females are larger than the males. The insects crawl up the trees: the female depositing her eggs on the leaves, and closing the leaves over. Sometimes the eggs are deposited on grass and weeds, therefore it is absolutely necessary to keep orchards free from weeds, as they are always a harbor for all kinds of insects. The following remedies have been tried, and have given fairly good results, viz.:—Spraying with arsenate of lead, and trapping the beetles. Experiments for the destruction of root-borers are now being carried out, under the supervision of Mr. E. E. Pescott, at the School of Horticulture, Burnley, and when finished the results of our investigations will be published in the *Journal*.

Conclusion.

The illustrations, and many notes on insects, are from the works of C. French, senior; W. W. Froggatt; and A. M. Lea.

* This insect is not illustrated.

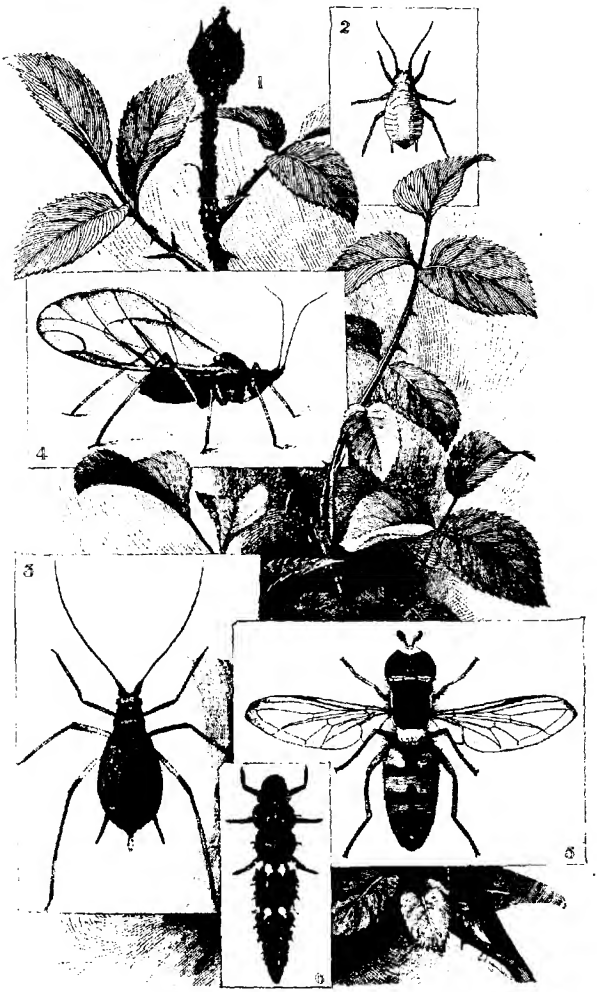

Fig. 27.—The Rose Aphis and its Parasites.

1. Spray of Rose-bush attacked by Aphis.
2. Larva of Rose Aphis.
3. Wingless Female Rose Aphis.
4. Winged Female Rose Aphis.
5. Hover Fly (*Psilopus Sydneyensis*).
6. Larva of Lady-bird Beetle (*Leis conformis*).

(After Froggatt).

FRUIT NOMENCLATURE.

The Pomological Committee of Australia.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley, Secretary.

At a conference of the Ministers of Agriculture, representing the various States of Australia, held in Brisbane in May, 1914, the following resolution was adopted:—

> "That a committee on fruit nomenclature be appointed, to consist of two representatives from each State appointed by the Government of each State, to meet as often as required, each to defray the expenses of its representatives, and the expenditure in connexion with the work of the committee to be jointly borne by the States. The chairman at each meeting to be one of the representatives of the State in which the meeting is held, and to have a casting vote."

Prior to that time, a committee on fruit nomenclature had been working in Australia under the auspices of the Australasian Fruit-growers' Conference. This committee consisted of two fruit-growers and one Government official, representing each State, and two meetings were held.

The first was held at the School of Horticulture, Burnley, Victoria, in April, 1913, and the second was held at Hobart, Tasmania, in May, 1914, concurrently with a large Inter-State fruit show, which had been organized so that the members of the committee might have the advantage of consulting the large number of exhibits of fruit in their work.

The effects of the Brisbane motion were (*a*) to supersede the committee appointed by the Australasian Fruit-growers' Conference, and (*b*) to appoint a committee under the auspices and control of the various State Governments.

The result is, that the work on pomological nomenclature is now being carried on under Government sanction and action, and it can now be worked on a firmer basis with official weight and decision.

That this action will be welcomed by the fruit-growers of Australia is shown by the following motion passed at the recent conference, which was moved by Mr. L. M. Shoobridge, of Tasmania, president of the Australian Conference of Fruit-growers, and seconded by Mr. H. Wicks, of South Australia.

> "That we appreciate very much the action of the various Governments of Australia in appointing this committee, as we feel that the more co-operation that can be obtained between growers and officials the more effective results will be obtained."

Pursuant upon the Brisbane motion of the Ministers of Agriculture, the newly-constituted pomological committee met at the School of Horticulture, Burnley, Victoria, on 25th, 26th, and 27th April, 1916.

The following delegates were present:—Mr. W. J. Allen, Department of Agriculture, New South Wales, and Mr. Tucker, President of the New South Wales Fruit-growers' Association, representing New South Wales; Mr. Geo. Quinn, Department of Agriculture, South Australia, and Mr. H. Wicks, representing South Australia; Mr. J. Ward.

Department of Agriculture, Tasmania, Mr. L. M. Shoobridge, and Dr. H. Benjafield, of Hobart, representing Tasmania; Mr. James Lang, J.P., Mr. F. W. Vear, and Mr. E. E. Pescott, Principal, School of Horticulture, Burnley, representing Victoria.

Queensland and Western Australia were not represented.

Mr. James Lang, J.P., was chosen as chairman.

In order to recognise the work done by previous committee, it was decided to adopt the two reports of the 1913 and 1914 sessions respectively; and so that the information may be readily available a summary of the work carried out is given here.

Change of Name.

APPLES.

Old Name.	New Name.
Five Crown Pippin	London Pippin.
Dumelow's Seedling	Dumelow.
Democrat	Tasma.
Dunn's Seedling, Munroe's Favourite	Dunn's Favourite.
Stewart's Seedling	Stewarts.
Schroeder's Apfel	Schroeder.
Emperor Alexander	Alexander.
Pomme de Neige, Snow Apple	Pomme de Neige.
Trivett's Seedling	Trivett.
Mellon's Seedling	Dunolly.
Yapeen Seedling	Yapeen.
Yeate's Nonpareil	Gowar.
Stayman's Winesap	Stayman.

PEARS.

William's Bon Chretien, Bartlett, Duchess	Williams.
Napoleon, Vicar of Winkfield	Vicar of Winkfield.
Giblin's Seedling	Giblin's Nelis.
Kieffer's Hybrid	Kieffer.
Harrington's Victoria	Harrington.
Laffer's Nelis, Laffer's Bergamot	Laffer.

It has been long recognised that the nomenclature of fruits grown in Australia, particularly that of apples and pears, was considerably confused owing to the various names and synonyms which were given to the fruits; and it is actually upon record that the growers have suffered pecuniary loss owing to certain fruits being known under different names in the different States. The following quotation from the report of Messrs. F. W. Moore & Co. Ltd., Australian fruit merchants, Covent Garden, London, dated 28th May, 1914, says:—

> "We have again to say that some of the Tasmanian growers spoilt their chance by persisting in marking Cleopatras as New York Pippin. Hamburg buyers show a decided preference for Cleopatra, but they are not all keen judges of fruit, and when they see a case marked 'New York Pippin' are prone to think there is really a difference, particularly when they see the apples are green and hard, whilst those of the same variety from the mainland States are yellow and soft. There is still another

point to be considered: many buyers in the auction room hold commissions from fruiterers hundreds of miles away to buy Cleopatras; they dare not buy for their principals cases that are marked 'New York Pippin.' It has been done, but fruiterers have repudiated, the Courts have been appealed to, and, despite the evidence of those who know there is not any difference, the Courts have decided that the grower would not have marked his cases 'New York Pippins' if the fruit had really been Cleopatra. At Tuesday's sale there was a difference of at least one mark (frequently much more) in fruit of equal quality but different marking."

In regard to the apple Cleopatra it has been proved that it is the apple which is largely grown in America under the original name Ortley. The committee have been unable to ascertain the source of the

Exhibit of Fruit at Conference, 1916.

name Cleopatra, but it is known to have first been used in Victoria about the year 1872.

Then in regard to the apple which has long been known in Victoria as Munroe's Favourite, and as Dunn's Seedling in South Australia, it was also known as Garibaldi, Gander's Seedling, and Golden Cup in various districts in Victoria; while it had been re-named Ohinimuri in New Zealand. The action of the committee in changing the name to Dunn's Favourite has been questioned; but, on the evidence submitted, it was decided to recognise the name of the raiser, Mr. Dunn, of South Australia, and to drop the name of Munroe, for it was only introduced into Victoria from South Australia by Mr. Munroe, who never claimed to be the raiser. Forty years ago, in the absence of any knowledge of its correct name, the apple was in Victoria named "Munroe's Favourite" by Mr. James Lang, of Harcourt, Victoria.

The principal reason, therefore, for the appointment of the committee was that the names of Australian-grown fruits should be revised, and

that in time each fruit would be recognised by one name, and by one name only, throughout Australia.

A second, and equally important work, is the recognition and description of Australian-raised seedling fruits.

This is important, as it is the opinion not only of the committee, but of many other growers and experts, that the time is not far distant when a type and class of fruits of each family will be evolved in Australia which will be especially suited to the climate and soil conditions of Australia.

The extensive planting of the apples Dunn's Favourite, Rokewood, Granny Smith, Carrington, Bismarck, Shorland Queen, Statesman, Stewarts, and others goes far to support this belief.

Two other important features of the work of the committee are the publishing of a list of apples and pears suitable to be grown in the various States, and of a list of apples which are known to be blight-proof, or free from the insect woolly aphis, or nearly so.

At the 1913 meeting 328 dishes of fruit were staged; at the 1914, there were shown nearly 1,000 dishes; while at the 1916 meeting 1,039 dishes of fruit were exhibited.

In regard to fruit nomenclature, the following rules are considered by the committee as urgent:—

1. That the names shall be as simple as possible.
2. That wherever possible, one word only should be used as a name.
3. Duplication of names, or names possessing strong similarity, is to be avoided.
4. That such words as "seedling" and "hybrid" be abolished from Australian pomology as far as possible.
5. That priority of name, naming, or of origin, have preference wherever possible.

At the 1913-14 meetings the following names were approved of:—

APPLES.

Cleopatra.
Scarlet Nonpareil.
King of Pippins.
Jonathan.
Cox's Orange Pippin.
Rymer.
Shorland Queen.
Maiden's Blush.
French Crab.
Gravenstein.
Rokewood.
Pomme de Neige.
Prince Alfred.
McIntosh Red.
Twenty Ounce.
Lady Daly.
Stone Pippin.
Alfriston.
Lane's Prince Albert.
Perfection.
Lang's Best.
Champion.
London Pippin.
Adam's Pearmain.
Dumelow.
Rome Beauty.
Peasgood's Nonsuch.
Yates.
Lord Wolseley.
Duke of Clarence.
Statesman.
Shepherd's Perfection.
Reinette de Canada.
Worcester Pearmain.
Granny Smith.
Lord Suffield.
Beauty of Bath.
Wealthy.
Winter Strawberry.
Warner's King.
Ben Davis.
Wagener.
Gascoigne's Scarlet.
Sutton.

PEARS.

Vicar of Winkfield.	Glou Morceau.
Le Lectier.	Duchess D'Angouleme.
Doyenne du Comice.	Winter Nelis.
Giblin's Nelis.	Madam Cole.
Winter Cole.	Elizabeth Cole.
Beurre Bosc.	Beurre Capiaumont.
Josephine de Malines.	*Howell.*
Packham's Triumph.	Packham's Late.
Beurre D'Anjou.	Clapp's Favourite.
Urbaniste.	Beurre Superfin.
Durondeau.	Thompson's.
Conference.	Beurre Diel.

At these meetings the following resolutions were adopted:—

1. That it be suggested to the Australasian Fruit-growers' Conference that models be made of typical fruits, to be selected by the pomological committee from the approved and confirmed varieties; that outline, sectional, and complete photographs be taken of each, and that sets of models and photographs be obtained and retained by each State Department of Agriculture.

2. That it be a recommendation to the Australasian Fruit-growers' Conference that the work of tabulating and historically recording all Australian seedling fruits and sports be delegated to this committee.

3. That no specimen of fruit be received by the committee for naming unless at least six specimens be forwarded, accompanied by full particulars, as far as possible, of origin, habit of tree, soil, locality, &c., and the name, if any, under which that fruit is grown. Such specimens to be forwarded through the various departmental officers of the committee.

4. That the various Government officers be asked to bring under the notice of their Departments the advisability of having photographs and models made of the various accepted fruits.

5. That a list of the principal commercial varieties of apples and pears suitable for planting, and their names as decided by the pomological committee, be submitted to the Australasian Fruit-growers' Conference, and that the conference be strongly urged to do its utmost to get growers in the different States to ship only under these names.

6. That each departmental officer shall prepare a list of apples which are resistant to the woolly aphis, such list to be forwarded to the president for publication in 1915.

A further business of these meetings was the preparation of a list of the principal varieties of apples and pears suitable for planting in the different States. This list was supplied by the members of the committee representing each State, and it has already been published.

1916 Meeting.

At this meeting the following resolutions were carried:—

1. This committee expresses its appreciation of the action taken by the Ministers of Agriculture in regard to the appointment of a permanent pomological nomenclature committee, thus acknowledging the work already done. The members would respectfully suggest that in addition to the two members already appointed an additional fruit-grower and

one fruit tree nurseryman from each State be nominated to assist the committee in its deliberations.

Note.—The committee does not ask that the Governments concerned should pay the expenses of these additional members. Such expenses, it is anticipated, would be borne by the bodies they represent. The reason that the committee makes the recommendation is that they feel the extra assistance would not only strengthen them, but would greatly facilitate the work of the conference.

2. That the Ministers of Agriculture be asked to write to the States not represented at this meeting stating that in view of the important work being carried out by the committee, they be asked to join in this work in the future, especially as in the case of Western Australia considerable work has been done by the committee for that State.

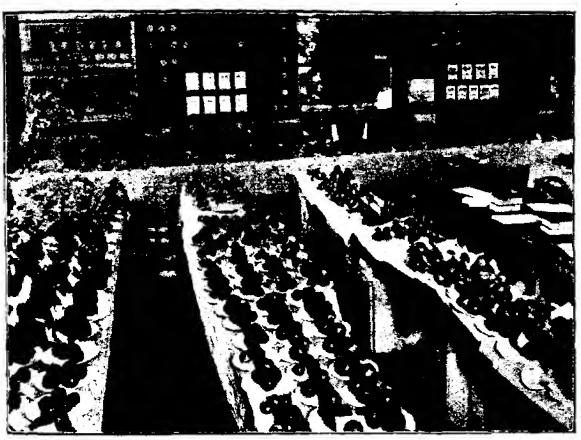

Exhibit of Fruit at Conference, 1916.

Note.—Three conferences have been held: Queensland was represented once, while Western Australia has not been represented at all.

3. The committee respectfully suggests to the Ministers that it be empowered to invite any prominent fruit-growers or nurserymen to attend the meetings as visitors, and to assist in the deliberations and discussions.

Note.—The presence of fruit-growers and nurserymen with special knowledge would be of great value to the committee. They would have no vote, and no expenses would be allowed them.

4. That this committee affirms the desirability of issuing certificates of merit to Australian-raised seedlings, and suggests to the Ministers of Agriculture that the committee be instructed to prepare a scheme to that end.

5. Before the committee recommends any seedling for an award samples of fruit must first be submitted for approval, together with full details as to the habits of the tree, and the immunity of the fruit and tree from disease. If it then be found that such fruit is worthy of a trial the committee would then recommend that the variety would then be treated at one of the Government orchards in the various States, particularly in the State in which the fruit is said to do best, and an annual report furnished to the committee by the members on the same. This refers more particularly to apples and pears than to soft fruits.

6. That the Minister of Agriculture for Victoria be asked to authorize and arrange for the despatch of certain fruits grown in Australia the nomenclature of which is much confused to the Royal Horticultural Society of England, for consideration and report by the fruit committee of the society, the originals of these fruits having been raised in and exported from Great Britain to Australia.

NOTE.—The committee selected four fruits this year—Broompark, Eyewood, and Black Worcester pears, and Strawberry Pippin apple.

7. That the members in the separate States form local State sub-committees to consider any seedling or new soft fruit that may be brought under notice, each sub-committee to record and report to each meeting of the general committee.

NOTE.—The time at which the committee meets, viz., about Easter, precludes the committee as a whole considering soft fruits for the present. No extra expense will be incurred in carrying out this resolution.

8. That the papier mâché models made by Mr. James White be adopted, and that the Ministers be recommended to have 24 models made this year.

NOTE.—Mr. White's models are wonderfully good, and the committee is of opinion that they could hardly be improved upon.

9. That it is desirable for each State to take sectional and complete photographic records of Australian seedling fruits; such photographs, with every possible record of the tree and fruit, to be presented at each meeting of the committee.

10. That it be an obligation upon all members accepting their nomination that they attend every session of the committee.

11. That this committee adopts the two reports of the work of the previous committee.

12. That the next meeting be held in the State of New South Wales during the week after Easter of 1917.

13. Regarding resolution 9 passed by the Brisbane Conference of Ministers of Agriculture, May, 1914, the following resolutions have been passed:—

(*a*) That the committee would be pleased to receive any suggestions of improvements of the Australian fruit case accompanied by samples, but up to the present no definite suggestions have been received by the committee.

(*b*) Precooling of Fruit.—In the case of pears, arrangements should be made to ship this fruit in separate chambers, and then precooling is desirable, provided that the whole of the contents of any separate chamber is precooled. In the case of apples, precooling is not considered necessary.

14. That the best thanks of the committee be passed to the Victorian Department of Agriculture for the arrangements made in facilitating the work of the committee, and also for its entertainment.

15. The following motion was carried by the fruit-growing members of the committee:—

On behalf of the Australian Fruit-growers' Associations we desire to appreciate exceedingly the action of the various Ministers of each State in appointing the nomenclature committee, as we feel that the more co-operation we can obtain between growers, nurserymen, and officials the more effective results will be obtained.

Note.—The various Government representatives were asked to convey this motion to each Minister.

The committee then considered the exhibits, and arrived at the following decisions:—

Pears.

1. Broompark, as grown at Mylor, South Australia, is Muirfowl's Egg. Eyewood, from Mr. Wade, Lilydale, Tasmania, is Muirfowl's Egg. It is not recommended that this pear should be grown.

2. Hacon's Incomparable, as grown at Burnley, is not true to name.

3. Broompark and Eyewood.—In view of the confusion in the nomenclature of these two pears, it was decided to send samples to England for identification by the experts of the Royal Horticultural Society.

4. Princess, as grown at the Burnley Horticultural Gardens, is correct.

5. The pear grown in Tasmania as La Conte is Princess.

6. Le Conte, as exhibited by New South Wales, is correct.

Note.—It was decided that the name of the pear La Conte introduced by Nobelius is too similar to the name of the sand pear Le Conte, and the committee is of the opinion that the name should be changed.

7. Black Achan, Black Worcester, and Verulam.—Owing to the confusion of these three fruits they are all to be referred to England.

Apples.

1. Strawberry Pippin, from South Australia, is not Winter Strawberry Pippin. This apple was originally grown under the name of Somerset Lasting, which it is not; this fruit is also to be sent to England. Strawberry Pippin, as exhibited from Dr. Stewart, Latrobe, Tasmania, and L. M. Murdoch, Glenorchy, Tasmania, are different, and are not the Strawberry Pippin as exhibited from South Australia. The Strawberry Pippin exhibited from New South Wales, from Mr. Wade, of Tasmania, and from Mr. L. M. Shoobridge, are identical. This fruit will be reported upon next year.

2. Newman's Seedling (originally Neumann), grown in South Australia.—There were four exhibits of this fruit, which is ready for export at the end of January. The following motion was carried:—"That the South Australian apple Newman is inferior to the apple Newman imported from America and grown at the Bathurst Experiment Farm, and that the committee does not recommend the growing of the local apple, to any extent. The New South Wales specimens of Newman's were correctly named.

3. Carrington and Lady Carrington.—The name Lady Carrington should not be used. There are two types, red and streaked. These are blight-proof, and are sometimes used for stock, instead of the Northern Spy. Aitken's Seedling, which is not blight-proof, is frequently sold in Victoria as Carrington. Mr. Allen will submit specimens of the complete set of these apples to the next meeting.

4. Dutch Mignonne.—The South Australian and Harcourt samples were correct. The Tasmanian specimens are to be considered next year. The apple grown in the Burnley Horticultural Gardens as Dutch Mignonne is the South Australian apple Beauty of Australia. This apple takes black spot freely. The apple grown in New South Wales as Beauty of Australia is entirely different from the South Australian variety.

5. Garibaldi.—This apple was raised at Urailda, in South Australia. There were four exhibits from Tasmania and one from South Australia. The exhibits were all different. The South Australian specimens were accepted as correct, but the apple is not recommended for planting. It is possible that the Tasmanian specimens may be Ridgway's Red. This fruit will be considered next year.

6. Crofton.—This apple was raised in Tasmania, and is one of Tasmania's best seedlings. It is an excellent apple, and good for cool storing; it takes aphis only slightly. The name Crofton was adopted, and the fruit recommended for planting in cool climates for late dessert purposes.

7. Foster, raised in Gippsland, Victoria.—Reputed blight-proof, and is possibly a seedling of the Northern Spy. Although there are several American apples of the same name, the committee decided to retain the name Foster, and not recommend it for export planting.

Consideration of Seedlings.

The following seedling apples and pears were forwarded to the committee for consideration:—

1. Beauty of Australia or Australian Beauty.—This is a chance seedling raised in South Australia by Mr. Bonython, of Summertown; it takes black spot badly and woolly aphis slightly. On account of the fact that the fruit has been exported to England satisfactorily, the committee approved of the naming of the seedling.

2. Glenone.—An apple raised by Mr. McKeown, of Dromana, Victoria. It is a seedling from Oslin, and is reputed blight-proof, and also that the wood will strike from cuttings. The name was approved of, but the apple was not recommended for general planting.

3. Streamville, raised by Mr. Murphy, of Arthur's Creek, Victoria.—It has been shipped successfully; it is a fair quality apple, and has a good colour, and will be reported upon at next meeting.

4. Croton, raised Ranelagh, Tasmania.—Several cases shipped to England brought 15s. a bushel. It grows well on poor soil, and is fairly free from woolly aphis; was awarded first prize at the Inter-State Fruit Show, Hobart, 1914, as a new variety. The name was confirmed.

5. Mayhew's Seedling.—There was nothing of special note in this apple. It was decided to hold it over for consideration at next meeting.

6. Cowell's Red Streak, raised in New South Wales.—An early apple, free from woolly aphis; reported as a valuable early apple for the New South Wales warm coastal climates.

7. Brown's Pippin, Peck's Seedling.—Two blight-proof apples from New South Wales. Were deferred for consideration next year.

A large number of seedling apples and pears were considered and rejected by the committee as being inferior to existing varieties in commerce.

Blight-proof Apples.

The following list of apples which are reported as being immune from woolly aphis, or nearly so, from various States, is issued by direction of the committee:—

Alexander.
Annie Elizabeth.
Bonum.
Carlton.
Cliff's Seedling.
Climax.
Commerce.
Early Richmond.
Foster.
Fall Beauty.
General Carrington.
George Neilson.
Gravenstein.
Hay's Midseason.
Irish Peach.
John Sharp.
Kenny's Autumn.
Lady Carrington.
Lang's Best.
London Pippin.
Lord Wolseley.
Magg's Seedling.
Marjorie Hay.
Menagere.
Mona Hay.
New England Pigeon.
Nickajack.
Northern Spy.
Perfection.
Pomme De Neige.
Purity.
Reinette Du Canada.
Ruby Pearmain.
Sharp's Early.
Sharp's Nonsuch.
Springdale.
Striped Beefing.
Takapuna Russet.
Trivett.
William Anderson.
Winter Majetin.
Winter Strawberry.
Yarra Bank.

POTASH FROM OLIVE OIL RESIDUES.

From analytical results published in the *L'Italia Agricola* by A. Aita, olive oil residues (the blackish, turbid liquid deposited at the bottom of the sink under oil presses) contained the following:—Soluble in water, 13.57 per cent., alkaline chlorides 1.57 per cent. The amount of potash in the liquid is given as about 1.5 per cent. or slightly more. By the evaporation and combustion of 100 gallons of this residue 30 to 35 lbs. of ash were recovered. The volume of the liquid is double that of the olive oil produced.

A Commission has been formed to consider the possibility of utilizing this residium for the manufacture of potash salts.
—Extract *Journal Industrial and Engineering Chemistry*, May, 1916.

Roughly, 10,000 gallons of this liquid would produce, on the figures given, approximately 1½ tons of ash, the potash content of which would make it worth £2 10s. per ton at the present price of potash.

NOTES ON PORTUGUESE WINE VARIETIES.

By F. de Castella, Government Viticulturist.

(Continued from page 570.)

Touriga.

Touriga, which is at the present time the most popular variety in the Alto Douro or Port wine district of Portugal, differs considerably from the sorts described in the two previous articles. Alvarelhao, so largely responsible for the "dry finish" of a true Port, yields a wine light in colour. The wine made from Bastardo rapidly loses its colour, in the same way that a "Grenache" does. Touriga, on the other hand, yields a wine rich in colour, and, in spite of the opinion of some old Portuguese writers to the contrary, its colour seems to possess considerable stability. In addition, it is a good and regular bearer, setting its fruit well, and little liable to spring frosts.

To these qualities are no doubt due the great popularity Touriga now enjoys. At the time of the writer's visit to the Alto Douro district, in 1907, it was generally looked upon as the leading port wine grape, though, in order to obtain all the qualities characteristic of this remarkable wine, the admixture of a certain proportion of other sorts appeared to be indispensable.

It is probable that it will prove to be a dual purpose vine, equally valuable for the production of dry and of sweet wines, in much the same way as Syra, better known as Shiraz, in Australia. Though Touriga is so largely grown for conversion into sweet wine in the Port wine district, it is also capable of yielding dry wines of excellent quality, as witness those of Dão (Portugal) made from the same grape. A dry red wine, made from this grape, was tasted by the writer at the Quinta de Malvedos;* it strongly resembled a dry Rutherglen Shiraz, suitable for export, and suggested the idea that Touriga may prove of value for the production of dry as well as of sweet wines in Australia. Mr. Burney's experience of this vine is most interesting, especially as regards the quality its fruit possesses of hanging on the vine, when fully ripe, without wasting, a point of great importance in a warm, dry vintage.

Is Touriga destined to displace Syra as the most generally useful wine grape in North-East Victoria? Time alone can tell. This is, to say the least, by no means impossible. Our present experience of the variety is such that it can be confidently recommended for propagation on a large scale with certainty of satisfactory results.

The following extracts from Portuguese writers concerning this promising grape may prove of interest. It will be seen that Touriga has steadily increased in popularity; largely, no doubt, in consequence of the growing favour for Ports of darker colour in the early part of last century, when it became the fashion to bottle and lay down "vintage" ports. The earlier writers are not in accord concerning several technical points in connection with this grape, as will be seen.

* A sample of this wine was submitted at official wine tastings in Melbourne and Rutherglen and was highly thought of; on analysis it was found to contain 24·5 per cent. proof spirit, 23·6 grms. per litre total extract, and ·64 per cent. total acidity (as tartaric). See p. 20, Report of Department of Agriculture, 1907-10, sample No. 24.

These earlier writers are also less enthusiastic concerning its virtues than later authorities.

According to Rebello da Fonseca (1791)—

"Touriga is a vine of copious yield, it ripens early and is said by those who are enthusiastic concerning it (*os apaixonados d'ella*) that it makes a wine with much colour. Nevertheless, it has been proved that after a certain lapse of time a wine which contains much of this grape becomes much discoloured (later writers dispute this); the greatest virtue I recognise in it is its copious production, even in poor soil; it requires, however, the same caution as regards pruning as Tinta Castellam," viz., very short pruning, to two or three spurs, each of three eyes.

Rubiao (1844) also recommends short pruning for it. Villa Maior is less drastic. He says—

"The bunches of this variety are borne always on the five first buds of the cane, there being frequently three bunches on each shoot. For this reason the

Fig. 7.—Leaf of Touriga (nearly half natural size).
Photo. taken at Rutherglen Viticultural Station, April 1913.

rod should always be pruned at the seventh eye The second variety of Touriga (Tourigao) produces its bunches at the last eyes and requires longer pruning.

Gyrao (1822) has a higher opinion of Touriga than Rebello da Fonseca. He mentions three sub-varieties of it, of which that named *fina*, or choice, is the best. (This is the one which has been introduced into Rutherglen.)

"It requires well exposed and strong soil; it yields an excellent wine with much colour; it is *anneira*, that is to say, it only bears well every second year."*

* Conselheiro Aguiar (1866) differs; he distinctly states that Touriga is not Anneira—see later.

He describes two other sub-varieties under the names of Tourigao or Tourigo Macho (male) and Touriga Foufeira, and suggests that they should be rooted up and replaced by layering. He advises against grafting them, "because they possess the singular property of not being capable of correction by way of grafting; even if grafted with the most excellent Touriga, they always remain the same; the nature of the stock or trunk triumphing over that of the scion."*

Villa Maior (1849-77) speaks very highly of Touriga. He refers to the little esteem in which it was held by Rebello da Fonseca—

"but what did he mean by Touriga? There seems no doubt that it was really Touriga he was writing of but in this case it is necessary to state that his opinion is contrary to the very positive results of long experience in the higher portion of the Alto Douro, that same region which I am describing, where the variety called Touriga is recognised to possess incontestable merits; so much so, that the rehabilitation of the viticultural reputation of several vineyards is attributed to it." He adds that this remark only applies "to the one primitively called Touriga which is one of the choicest and best we know."

He is emphatic as to the importance of selecting the choicest varieties in order to insure quality in the wine. "It is not alone on the wine making that the quality of the wine depends, but mainly on the richness of the grapes produced by special varieties of vines grown under the influence of a favorable climate and of a soil appropriate to its particular nature." Notwithstanding the opinion of Pliny and those writers who hold that the soil plays the leading part, he points out "that it is powerless to enable a choice wine to be extracted from a coarse or even from a mediocre grape. The vine-grower is powerless to change his soil or climate, but, on the contrary, he has free choice of the varieties best suited to the special conditions of these."

He quotes the well-known opinion of Dr. Guyot concerning the predominant part played by variety, concluding with the following curious passage, of special interest to Australians:—"I can myself testify to the truth of this as I had occasion to state in my report concerning the Paris Exhibition of 1867. Speaking of the wines of Southern Australia, the wines of New South Wales and those of Victoria, made exclusively from good varieties imported from Burgundy and the Medoc, showed the distinctive character of the wines of these last-named regions."

Writing in 1873 the same writer states "Touriga is one of the varieties most highly esteemed in the Douro vineyards, mainly in the region between Tua and Pinhão, where, together with Tinta Francisca and Mourisco Tinto, it serves to produce the most generous wine."

He states that ripe Touriga grapes produce on an average 55.7 per cent. of must of a gravity of 1.115 (15° Beaumé) containing 24 per cent. of sugar and .34 per cent. of acids (as sulphuric).

As further proof of the high quality of Touriga he states that "the vineyards of Soutello, in the Pesqueira district, were formerly planted with mixed varieties of low grade, furnishing mediocre wines. A well-known proprietor, Sr. Bento de Querios, knowing the precious qualities of Touriga, caused this variety to be propagated in his vineyards by grafting, with the result that to-day Soutello yields excellent wines of the highest class."

Villa Maior further refutes Fonseca's poor opinion of Touriga—"What that author said of the little permanence of the colouring matter of Touriga wine has not been confirmed since we are better acquainted with this variety."

Mas and Pulliat (1877) quote Villa Maior as saying that Touriga "is a variety much appreciated in the upper part of the Douro region, which produces the best wine of Portugal, because its yield is very regular, and because it gives to the wine a most agreeable taste of fruit, reminding of that of a Reinette apple. It is, together with Tinta Francisca and Mourisco Tinto, the dominant vine in these vineyards."

* This is in contradiction with modern scientific views concerning grafting. French scientists deny that *specific variation*, in other words, a durable change, can be brought about in the scion through the agency of the stock. Possibly the faulty Touriga vines referred to were affected with the obscure disease, known in France as *Court Noué*, which seems to be similar to what we know as "Rogue" vines in Victoria.

According to Count Odart, it is the variety which contributes most to the good quality of the Douro or Porto wines, and principally by its fine colour.

Conselheiro Aguiar (1866) states that Tourigo is late (Serodia), of abundant production, not *Anneira,* and that it ripens its fruit from first to fifth October. It prefers soils of medium strength, and yields poorly on cold soils. He deals with the three sub-varieties mentioned above.

Oliveira Junior (1871) states that—

"Of the different varieties cultivated on the Douro, Touriga has been observed to best resist unfavorable climatic conditions; in addition it has another and not less valuable advantage: that of yielding abundantly. These two advantages lead us to recommend its propagation in substitution of other sorts which do not combine these conditions. Some growers, realizing this, are proceeding to graft."

Cincinnato da Costa deals at some length in *O Portugal Vinicola* with Touriga, which—

"May be considered one of the most precious black grape of the Douro region. It is known as *Tourigo* in the adjoining province of Beira Alta and

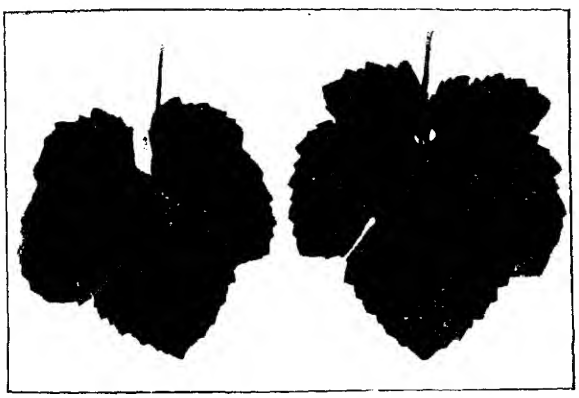

Fig. 8.—Leaves of Touriga (about one-third natural size).

Photo. taken at Quinta da Boa Vista, Alta Douro, Portugal, in October 1907. The leaves are spotted with Bordeaux mixture, sprayed to prevent Downy Mildew (*Plasmopara viticola*).

Azal in Minho. On the Douro it is known as Touriga Fino to distinguish it from two other sub-varieties, viz., Tourigão, Tourigo or Touriga Macho (male) and Touriga Fourfeira, which are inferior."

"Touriga is a variety of which the value is well known and justly appreciated in the north of the country for the quality and quantity of its yield. It is one of the typical sorts of the Douro region where it forms an integral part of the principal vineyards. It seems here to be so well suited to the prevailing conditions that it is the one which best resists adverse weather conditions."

"In the Beira region (further south) especially between the rivers Mondego and Dão where the wines have a character of their own and are justly celebrated, Touriga is the predominating variety and the one from which are mainly derived the notable qualities which characterise the wines of the vineyards which fringe these rivers."

It is interesting to note that the wines of Dao are not sweet wines of Port type, but dry red wines, after the style of a French Burgundy.

The article on Touriga in "Ampelographie" is contributed by Sr. Duarte de Oliveira, one of the leading Portuguese viticultural authorities at the present time. He is an enthusiastic admirer of this valuable vine, as will be seen from the following abridged extracts:—

Souzão* and Touriga are really contemporaries—their culture extended on the Douro and in Tras os Montes when the Port wine trade, mainly in the hands of London merchants, demanded highly coloured wines to blend with those of France, which, in spite of their excellent quality, lacked the colour sought after on the London market. When the wines of Porto were first introduced into England they were used to improve (*concertar*) weak French wines. . . . In the reign of William and Mary, before war between England and France, the annual English consumption of Port amounted to 500 pipes.

In a footnote the following interesting particulars are given:—"The British preference for Portuguese wine received a strong stimulus from the Methuen treaty. In 1817 Port wine paid a duty of £27 5s. 3d. per ton as against £56 5s. charged on French wine. According to Dr. Halley, these circumstances have so encouraged the wine trade that the Portuguese have begun to seriously develop the cultivation of the vine; their plantations soon occupied a surface of 30 or 40 leagues on both banks of the Douro, so that owing to this trade, the wealth of the country (Portugal) has increased simultaneously with its population!"

The name Touriga seems to be a modification of Tourigo, a village in Beira Alta, where it seems to have originated. In the south of Portugal a variety called Tourigo is much cultivated, similar, if not identical, with Touriga.

Sr. Duarte de Oliveira denies the supposed identity of Touriga and Cabernet, which was asserted by some earlier writers; he also holds that Villa Maior is wrong in giving *Azal* as a synonym. The two varieties have really nothing in common.

He quotes Lacerda Lobo, who states that "Touriga was already, in 1790, to be found in several vineyards of Tras os Montes and Douro, the two provinces which produce the wine exported under the name of Porto—a name which justly enjoys a universal reputation. There is thus no doubt that Touriga is a variety which belongs to the first epoch of the Renaissance of Portuguese viticulture.

Though widely distributed throughout Portugal it is more particularly in the Port wine district that its value is thoroughly recognised. In a vineyard where no Touriga is grown the wine loses much of its commercial value. Even before Phylloxera, on both banks of the Douro, from Regoa to the Spanish border, this variety predominated in all the vineyards, proprietors forestalled the desire of the purchaser by assuring him that their wine contained much Touriga. Its name was sometimes a sort of passport for wines of doubtful quality.

With reconstitution, Touriga was somewhat neglected; but, after a while, it was recognised that it could not be overlooked if a good price for the crop was desired. And so Touriga began to be grafted everywhere, and now it is regaining, day by day, the lost ground.

In Tras os Montes, a viticultural branch of the Douro, Touriga is beginning to reconquer the ground. Within a few years this province will produce wines surpassing some of those of the Douro, which had an established reputation, but in connexion with which the choice of the best scion varieties had been neglected.

Touriga is not one of the first sorts to come into leaf in spring, and its buds are fairly resistant to spring frosts. It blossoms late, stands bad weather well, and rarely fails to set its fruit. It should be pruned long on good soil, but may be pruned short on dry hill sides. In such a situation the yields suffers if manures are not applied.

Touriga appears to bear much more heavily when grafted on resistant stocks than on its own roots. A case is mentioned of Touriga grafted on A.R.G.1, which yielded over 700 gallons per acre, whereas the same variety on its own roots alongside only bore half as much. It resists oidium well.

* Souzão is a Portuguese variety, mainly remarkable for the intense colour of the wine yielded by it.

Some of the authors mentioned above are quoted, as well as some others, all of whom look upon Touriga as a Port wine variety of the very first order. Sr. Duarte de Oliveira continues—

In order that the wine of Touriga may possess all its quality, complete maturity of the fruit must be awaited; the wine is then very alcoholic, of rather light body, and of a brilliant red colour, darker than the famous Cabernet Sauvignon, than which it has more body and character.

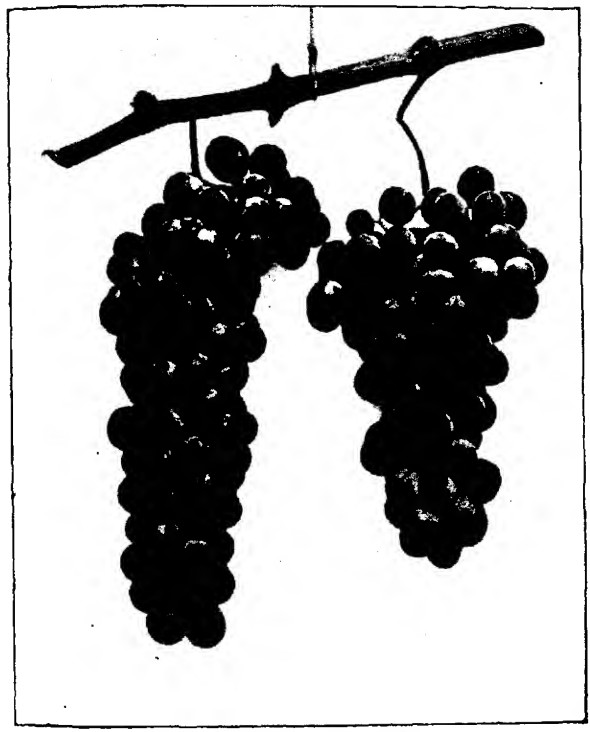

Fig. 9.—Bunches of Touriga Grapes.

Reproduced from *O Portugal Vinicola* by B. C. Cincinnato da Costa, reduced to half natural size.

The following ampelographical description is given:—

Vine.—Very vigorous; main stem cylindrical or slightly flattened; old bark brownish-red, easily detachable in short and narrow strips.

Buds.—Strong, with young leaves golden white, silky on both sides, with a rose carmine edge; three-lobed at first, but the five lobes are distinctly visible on the third leaf.

Canes.—Medium, semi-erect, pale glossy green and glabrous whilst still herbaceous, light-brown when the wood is ripe, moderately striated; internodes medium, from 8 to 10 Cm. (3 to 4 inches) long; buds slightly prominent, not brittle; tendrils numerous, large, bifurcated.

Leaves.—Five-lobed, of medium size, as long as broad; limb not bulgy, dark-green, slight cobweb like tomentum above; under surface very cottony, whitish; substance of leaf pliable, velvety to the touch, reminding of chamois leather; first and second sinus deep, almost U-shape; petiolar sinus open, sometimes narrow, almost closed, so that the edges of the lobes touch; veins not prominent; teeth shortly mucronate, tinted with pale-yellow. Leaf-stalk long, glabrous, reddish. In autumn, after vintage, the leaves become yellowish-green, with bands of bright-carmine.

Fruit.—Bunches of medium length, cylindro-conical, fairly loose, short; stalk branched, bearing frequently another bunch almost as large as the principal one, but not shouldered; pedicels long, thin; core short, reddish-yellow at the centre; stalk very long, fairly strong, and generally flattened.

Berries.—Almost spherical, of irregular size, small rather than large, bluish-black; pulp soft, juicy and perfumed; skin hard, rich red colour; pips per 100 berries—44 with one each, 48 with two, and 8 with three.

(*To be continued.*)

THE USE OF LITTERS IN SAVING NATURAL MANURES.

Various litters are in use, mainly for bedding, but in some cases for absorbing liquid excreta and in the subsequent disposal of the manure a large amount of this litter is sold.

Litters in common use are cereal straw, shavings, sawdust, and bracken fern.

In an article under the heading of "Some Effects of Litter on the Fermentation of manure," by W. E. Tottingham, appearing in the *Journal of Industrial and Engineering Chemistry,* June, 1916, the results of some very interesting experiments are given.

The author used oat straw, oak shavings, and pine shavings as litter, and one part of fresh horse excreta with two parts of fresh cow excreta as a manure.

The results, after twelve weeks' fermentation, proved the manure with oat straw as litter to contain 17.94 per cent. humus, with 9.5 per cent. soluble nitrogen, whereas the manure containing oak shavings litter contained 12.07 per cent. humus and 5.91 per cent. soluble nitrogen, whilst the manure with pine shavings litter contained 11.81 per cent. humus and 5.67 per cent. soluble nitrogen.

In addition, the bacteria in 1 gram of the oat straw manure was 12.7, against 3.7 and 4.7 in the cases of the oak shavings and pine shavings respectively. The results of field experiments conducted by Professor E. B. Hart coincide with the above laboratory experiments—the increased yield from the oat straw litter manure being approximately 10 per cent. higher than that where oak and pine shavings were used as litter.

The results presented seem to furnish argument regarding the value of some litters at present in use, and certainly interesting particulars would be supplied by an investigation on the subject of the use of other litters.

NOSEMA APIS IN VICTORIA.

By F. R. Beuhne, Government Apiculturist.

Nosema apis, an animal parasite of the digestive tract of the honey bee, and the cause of a disease fatal to bees in Europe, was first discovered in Victorian bees in 1909. (*Journal of Agriculture*, January, 1910, p. 58.) Following, as it did, upon a heavy mortality of bees which occurred in the Stawell district during the winter and spring of 1909, the discovery of the Nosema parasite in Victoria caused some alarm amongst beekeepers.

The investigations made in Great Britain proved that the parasite when introduced into healthy bees produced the disease known there as Isle of Wight Disease. A comprehensive report of the investigations was published by the British Board of Agriculture in May, 1912. The authors of this report (p. 126) recommend the destruction of the bees and combs of affected hives as the only effectual means of dealing with this disease.

As the Victorian investigations, which were made by Mr. W. Laidlaw, B.Sc., Government Biologist, after the discovery of Nosema in Victoria, proved that the parasite was present in almost every apiary, that even wild bees in trees were affected, it appeared, therefore, hopeless to attempt the eradication of the disease by destroying the infected bees and combs.

Bees from eighty-eight widely-separated apiaries were examined and the presence of the Nosema parasite proved in all but two, one of which was the departmental apiary at the Burnley School of Horticulture. In several instances the bees which showed Nosema infection came from apiaries in which no mortality or dwindling ever occurred, and it appeared, therefore, doubtful whether the presence of the parasite in the bees is in itself necessarily fatal, or that it greatly interferes with the productiveness of the hives excepting under certain conditions due to climatic influences.

In view of the wide distribution of Nosema in Australia, the fact that losses occur only after drought seasons, and that no fresh outbreaks of the disease followed the restocking with bees of defunct hives, it would appear that under normal climatic conditions this parasite is, in Australia, merely a casual inhabitant of the alimentary canal of the bee. In fact, under ordinary conditions the disease is endemic, and becomes epidemic only when the vitality of the bees is impaired by the malnutrition during the bee's larval development, which is caused by a dearth or the inferior quality of the nitrogenous food which bees obtain solely from the pollen of the flowers of plants.

The comparative harmlessness of Nosema apis in Australia during normal seasons suggested that the introduction of queen bees from infected stocks in one locality to colonies free from the parasite located in another district would not necessarily produce infection, and that affected dwindling colonies would probably recover in new and favorable surroundings.

With a view of arriving at some definite conclusion on this point, some tentative experiments were undertaken during the season 1913-14.

Queens and their escorts of worker bees from colonies proved to be affected with Nosema were introduced to several colonies at the Burnley apiary. No symptoms of disease developed, and Nosema was not found in bees from these colonies, examined by Mr. Laidlaw at intervals of two and three months.

To ascertain whether affected bees would recover on removal to a locality favorable to reproduction, an opportunity presented itself when, in October, 1914, the spring examination of the writer's apiary at Tooborac showed that, owing to the severe drought of the previous season, all the colonies were much weaker than is usual at this time of year, and that out of 180 colonies, 40 were in such poor condition that their ultimate recovery appeared to be very doubtful.

On 8th October, 1914, fourteen of the smallest of the dwindling colonies were removed to the Burnley Gardens. At the end of December they had recovered to normal strength, while of the twenty-six declining colonies left at Tooborac none had progressed appreciably, some had further declined, and two had been lost.

In view of the encouraging result obtained, the Chief Veterinary Officer directed that a further and larger experiment, with periodical microscopical examinations of bees from all the hives, should be made. Of the twenty-four affected colonies remaining at the Tooborac apiary, nineteen were transferred to the Burnley Gardens, five being left at Tooborac as controls.

The first microscopical examinations after the arrival of the bees at Burnley were made by Mr. Laidlaw in February, 1915, when the whole of the nineteen stocks were found to be infected with Nosema in various degrees. Bees from the five control hives at Tooborac were also examined and found to be similarly affected.

At the second examination made in May, 1915, only three showed Nosema, fifteen were free from it, and one had succumbed to starvation, while the five control colonies at Tooborac still showed Nosema infection, but of a lesser degree.

Owing to an unusual scarcity of nectar during March and April, it became necessary to feed the eighteen experimental colonies. This was done early in May, sugar syrup being given to fourteen and honey of unknown origin to four (Nos. 181, 186, 195, and 227). During August two colonies (Nos. 2 and 116) were lost through robbing started by the overturning of a hive.

Mr. Laidlaw made the third examination of bees from the sixteen remaining colonies, when it was found that twelve were free from Nosema, and four (Nos. 59, 186, 195, and 227) showed infection. Reference to the table A shows that three of these (Nos. 59, 186, and 227) were free from infection in May, and there is at least strong suspicion that they became re-infected through the honey fed (the infection of No. 59 being probably due to robbing from one of the honey-fed hives).

When the third examination of bees from the control hives at Tooborac was made in September, 1915, two of the five colonies had disappeared, but the surviving three were free from Nosema and in a thriving condition.

A further examination of bees from the four colonies still infected at Burnley was made by the Biologist on 18th and 29th January, 1916, when only one colony (No. 195) remained slightly infected.

The time for which the experiment was arranged having expired, the colonies experimented with were returned to Tooborac in March, 1916.

Nosema Apis Investigation.

Summary of Microscopical Examinations made by Mr. W. Laidlaw, B.Sc.

Hive No.	1st Exam. Date.	1st Exam. Nosema Per Cent.	2nd Exam. Date.	2nd Exam. Nosema Per Cent.	3rd Exam. Date.	3rd Exam. Nosema Per Cent.	4th Exam. Date.	4th Exam. Nosema Per Cent.	Notes.
	1915.		1915.		1915.		1916.		
2	Feb. 11th	75	May 7th	40	Aug. 7th	Turned over and robbed out			Fed Sugar Syrup. May, 1915.
6	,, 22nd	15	,, ,,	0	Sept. 23rd	0	.. ..	..	
16	,, 11th	70	,, ,,	0	,, ,,	0	.. ..	..	
40	,, 22nd	20	,, ,,	0	,, ,,	0	.. ..	..	
48	,, ,,	25	,, ,,	0	,, ,,	0	.. ..	..	
59	,, 11th	85	,, ,,	0	Oct. 8th	25	Jan. 18th	0	
83	,, ,,	40	,, ,,	0	,, ,,	0	.. ..	..	
94	,, 22nd	10	,, ,,	0	,, ,,	0	.. ..	..	
110	,, 11th	70	,, 1st	Dead of starvation					
111	,, 22nd	15	,, 7th	0	Oct. 8th	0	.. ..	..	
116	,, 11th	90	,, ,,	20	Aug. 7th	Robbed out			
129	,, 25th	10	,, ,,	0	Oct. 15th	0	.. ..	..	
144	,, 11th	100	,, ,,	0	,, ,,	0	.. ..	..	
164	,, 22nd	50	,, ,,	0	,, ,,	0	.. ..	..	
173	,, 11th	35	,, ,,	0	,, ,,	0	.. ..	..	
181	,, 22nd	70	,, ,,	0	Nov. 1st	0	.. ..	..	
186	,, 11th	85	,, ,,	0	,, ,,	25	Jan. 29th	0	Fed honey May, 1915.
195	,, 22nd	65	,, ,,	15	,, ,,	100	,, 18th	10	
227	,, 25th	55	,, ,,	0	,, ,,	45	,, ,,	0	

Control Colonies Left at Tooborac.

Hive No.	1st Exam. Date.	1st Exam. Nosema Per Cent.	2nd Exam. Date.	2nd Exam. Nosema Per Cent.	3rd Exam. Date.	3rd Exam. Nosema Per Cent.
	1915.		1915.		1915.	
32	Feb. 5th ..	100	April 16th ..	25	Sept. 23rd ..	Dwindled out
41	,, ,, ..	100	,, ,, ..	55	,, ,, ..	0
44	,, ,, ..	90	,, ,, ..	50	,, ,, ..	0
185	,, ,, ..	50	,, ,, ..	35	,, ,, ..	Dwindled out
212	,, ,, ..	70	,, ,, ..	10	,, ,, ..	0

The experiment was started rather late in the season, and the conditions as to nectar supply were unfavorable. Pollen, however, was always plentiful, which enabled the colonies to completely recover, only one still showing Nosema when the hives were returned to their former locality.

It seems evident that the destruction of Nosema-infected bees and combs which is insisted on in Europe is not necessary in Australia. The cause of the lesser virulence of the Nosema disease is probably climatic, the drier atmosphere and the greater heat of the sun during summer arresting the progress of the disease.

Experiments made by Dr. F. G. White, of the United States Department of Agriculture, and published in *Bulletin No.* 92, showed that the Nosema germ did not survive a temperature of 57°C. (134.6°F.) continued for ten minutes.

This degree of temperature is easily exceeded out in the sun during our summer months, so that where hives are out in the open on ground kept bare and free of herbage and litter, sunlight perhaps destroys most of the spores in the surroundings of a Nosema-infected apiary.

A glance at the summary of microscopical examinations shows that even badly-affected colonies may completely recover under favorable conditions, but that one colony retained the parasite throughout, and may be considered a disease carrier.

It is probably such colonies which neither die out with the disease nor ever get rid of the infection, even under the most favorable conditions, which carry the parasite over a series of normal seasons, and act as nuclei of the epidemic after dearth of pollen in drought seasons has lessened the vitality and resistance of bees.

The table of control hives (B) shows that badly-affected colonies may recover without any assistance, provided sufficient bees survive till better conditions of food and temperature prevail.

To reduce as much as possible the chance and degree of infection, and thereby lessen the severity of epidemics, I would strongly advise beekeepers—

1. Not to locate hives in shady situations.
2. To keep the ground around the hives bare and clean.
3. To keep water from penetrating the hives during winter.
4. To re-queen all colonies which, from no visible cause, lag behind the average, and are therefore possibly disease carriers.
5. To use for re-queening only queens from stocks which, by their yields of honey due to the longevity of the workers, have proved their resistance to disease.

ARTIFICIAL FERTILISERS.

An impression of the enormous quantities of artificial fertilisers employed in the world before the outbreak of war is shown in figures published in England. The figures cannot be more than approximate, but they serve to show how dependent agriculture has become upon the fertiliser industry. 1. Phosphate of lime—The total production is estimated at about 10,000,000 tons, of which 8,000,000 may be attributed to superphosphate, and 2,000,000 to basic slag. This does not include the large quantities contained in guano, bones, &c. 2. Potash salts—The Stassfurt mines delivered potash salts in different forms equal to about 500,000 tons of pure potash. 3. Nitrate of soda—The shipments of this commodity from Chili amounts to about 2,000,000 tons a year, of which it is roughly estimated that three-fourths are for agricultural and one-fourth for chemical industries. 4. Sulphate of ammonia—The total production approaches 1,000,000 tons a year, which is employed for agricultural purposes.—*Canterbury Times.*

FARM MANUFACTURED BUTTER.

Its Moisture Content; and Some Factors which Influence it.

By E. E. Ash, Dairy Supervisor.

The law in Victoria, as it at present stands, allows up to 16 per cent. of moisture in butter. This is well known to the factory manager, who usually takes the necessary steps to see that the produce of his factory complies with the above regulation. But can the same be said of butter manufactured on the farm? There is good reason to suspect that a considerable quantity of the butter manufactured on the farms during the hotter months of the year would, if analyzed, show a moisture content above that allowed by the Act. The farmer does not overload his butter with water with the intention to defraud, but does it through ignorance. His knowledge of the factors which govern moisture content are small, and he has no means of ascertaining the amount of water the butter contains. Some conditions which favour an excess of moisture are outside the control of the butter maker, but others are directly under his control. A general knowledge of the whole subject cannot, therefore, be other than helpful to him. The mechanical condition or texture of butter is largely responsible for its moisture contents. Butter which is soft takes up and retains more moisture than hard or firm butter. Butter churned at a high temperature will, therefore, contain more moisture than that which is churned at a low temperature. Butter is composed of various fats and oils, one of the chief of which is olein. This is a fat somewhat similar to olive oil, which remains liquid at fairly low temperatures. The percentage of olein in butter appears to largely govern the texture or mechanical condition of the butter. Butter with a high percentage of olein is always softer than that in which some of the other fats (such as palmitin and stearin) predominate. The class of feed the cows get has a good deal to do with the composition of the different fats in butter. Foods rich in fats like oilcake, linseed, and the young grass in the spring, have a tendency to make the percentage of olein high, and incidentally to make the butter softer and retain more moisture. Foods like hay, roots, &c., usually make a firmer butter. The size of the fat globules in the milk also appears to have some influence on the firmness of the butter. Milk obtained from a herd of Jerseys contains larger fat globules than that from Ayrshires or Shorthorns. By this it is not inferred that butter made from a herd of Jerseys would necessarily contain a higher percentage of water than that obtained from Ayrshires or Shorthorns, but that there would be a tendency to a higher moisture content unless proper churning conditions were observed. The milk from newly-calved cows contains larger fat globules than that obtained from cows later in the period of lactation. It will thus be seen that there are many influences which may have an effect on the moisture contents of butter; but for all practical purposes the farmer need not concern himself about the size of fat globules, or the percentage of the different fats in butter. It is better for him to turn his attention to proper churning methods, and to the control of

temperatures during the whole butter-making operations. For the butter maker on the farm the summer is the trying time. Very few farms are equipped with refrigerating or cooling machinery. And great difficulty is experienced in getting the cream down to a sufficiently low temperature for successful churning, with the result that the butter is soft and greasy in texture and contains an excess of moisture. In addition, there is a considerable loss of butter fat when cream is churned at a high temperature. Though there is a number of factors which affect the moisture contents of butter, the principal one is the control of temperature. The moral is: Use the thermometer in butter-making operations, and don't guess at things. For summer churning get your cream down to as near 52 to 54 degrees as possible. And for washing and working purposes use the coolest water available

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Do not attempt to feed young pigs on roots, especially raw roots, though a certain quantity might be used to supplement other feeding. Roots contain far too much water in the first place, and in the second place they contain far too little digestible albuminoids to nourish young animals and enable them to grow. If roots are to be used in any quantity, they should be supplemented by some dry food containing a high percentage.

The value of the butter exported from New Zealand in 1915 was £2,700,625, as against £2,338,576 in 1914, and the cheese exports were valued at £2,730,211, as compared with £2,564,125. The total value of the dairy produce exported in 1915 was £5,430,836, as against £4,902,701 in 1914, an increase of £528,135. The frozen meat exported totalled £7,794,395 in 1915, as compared with £5,863,062 in 1914, an increase of £1,931,333, or over 31 per cent.

Of all the organic nutrients in a fodder, fibre has the lowest feeding value. As a rule, fodder which has a high percentage of fibre has a low feeding value. Fibre, in so far as it is digestible, is used by the animal in the same way as starch, but in the majority of feeds the fibre is largely undigestible, and is consequently valueless for the nutrition of the animal, though it may be of some service in giving bulk to the feed—a point of some importance. But the farmers' coarse fodders always supply a sufficiency of this constituent, and there is no reason for purchasing it.

Carbohydrates is a chemical term to include starch and materials closely allied to starch chemically. Starch does not form muscle, or blood, or the curd of milk, or wool, but it furnishes, by its combustion within the body, the heat which is necessary for the existence of the animal. It is also a producer of energy or the capacity of work within the animal. But it is well to remember starch has not the same value as fat, weight for weight, as a heat and energy producer. Approximately 1 lb. of fat is equal to 2½ lbs. of starch for these purposes.

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916-1917.

Commenced 15th April, 1916; concluding 14th April, 1917.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE BY THE DEPARTMENT OF AGRICULTURE, VICTORIA.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.8.16	15.8.16 to 14.9.16	Total to Date (Five months).	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
1	G. McDonnell	White Leghorns ..	473	147	620	1
10	J. H. Duncan	,, ..	457	150	607	2
13	H. J. Meaddows ..	,, ..	466	138	604	3
7	C. J. Jackson	,, ..	481	119	600	4
25	A. H. Mould	,, ..	468	127	595	5
40	A. Brundrett	,, ..	451	139	590	6
36	E. W. Hippe	,, ..	451	135	586	7
41	Excelsior Poultry Farm ..	,, ..	444	132	576	8
27	John Blacker	,, ..	446	128	574	9
22	Mrs. H. Stevenson ..	,, ..	440	134	574	
38	V. Little	,, ..	432	132	564	11
24	Mrs. H. Mirams ..	,, (5 birds)	443	118	561	12
37	J. M. Smith	,, ..	420	137	557	13
28	S. Cheatle	R.C.B. Leghorns ..	427	129	556	14
17	W. G. Swift	White Leghorns ..	420	132	552	15
15	G. Laughlan	,, ..	411	134	545	16
44	J. Jamieson	,, ..	403	137	540	17
3	W. M. Bayles	,, ..	393	144	537	18
45	C. H. Oliver	,, ..	399	131	530	19
23	T. A. Pettigrove ..	,, ..	408	122	530	
14	W. R. Huntler	,, ..	392	131	523	21
30	F. T. Denner	,, ..	395	119	514	22
34	F. G. Silbereisen ..	,, ..	384	118	502	23
18	C. Ludwig	,, ..	376	126	502	
32	N. Burston	,, ..	377	122	499	25
39	L. McLean	,, ..	361	138	499	
6	J. J. West	,, ..	355	131	486	27
16	F. Collings	,, ..	356	128	484	28
12	G. Hayman	,, ..	339	139	478	29
26	Mrs. A. Dumas	,, (5 birds)	355	121	476	30
11	R. W. Pope	,, ..	328	144	472	31
29	A. S. Hyndman	,, ..	332	133	465	32
101	A. E. Silbereisen ..	,, ..	329	123	452	33
8	E. A. Lawson	,, ..	311	139	450	34
43	S. Buscumb	,, ..	298	140	447	35
19	Benwerren Egg Farm ..	,, ..	302	128	430	36
5	W. G. Osburne	,, ..	289	119	408	37
35	Tom Fisher	,, ..	242	121	363	38
20	H. I. Merrick	,, ..	248	114	362	39
9	W. H. Clingin	,, ..	225	128	353	40
33	E. F. Evans	,, ..	230	118	348	41
4	Fulham Park	,, ..	169	121	290	42
31	J. H. Gill	,, ..	135	127	262	43
		Total ..	15,861	5,602	21,463	
		HEAVY BREEDS.				
		DRY MASH.				
93	Marville Poultry Farm ..	Black Orpingtons ..	509	161	670	1
97	D. Fisher	,, ..	485	136	621	2
102	Oaklands Poultry Farm ..	,, ..	464	147	611	3
95	Mrs. H. Coad	,, ..	384	131	515	4
96	Mrs. T. W. Pearce ..	,, ..	346	138	484	5
98	H. Hunt	,, ..	280	138	418	6
94	J. Ogden	,, ..	181	132	313	7
		Total ..	2,649	983	3,632	

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916–1917—*continued.*

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.8.16.	15.8.16 to 14.9.16	Total to Date (Five months).	Position in Competition.
		LIGHT BREEDS.				
		DRY MASH.				
46	W. H. Robbins ..	White Leghorns ..	545	157	702	1
59	T. A. Pettigrove ..	,, ..	536	139	675	2
52	W. J. Thom	,, ..	493	160	653	3
56	Mrs. Nicoll	,, ..	493	123	616	=4
53	W. N. O'Mullane ..	,, ..	470	146	616	=4
70	G. Wilkinson	,, ..	465	137	602	6
58	C. Ludwig	,, ..	448	145	593	7
47	H. McKenzie and Son ..	,, ..	427	158	585	8
61	C. C. Dunn	,, ..	454	119	573	9
65	Izard and Tierney ..	,, ..	431	139	570	10
54	Mrs. A. O. Hughes ..	,, ..	428	138	566	11
62	J. W. Morrow	,, ..	420	134	554	12
48	Thirkell and Smith ..	,, ..	374	134	508	13
69	E. A. Lawson	,, ..	364	141	505	14
55	Rev. J. Mayo	,, ..	357	145	502	15
60	A. Greenhalgh	,, ..	359	131	490	16
67	Lysbeth Poultry Farm ..	,, ..	339	136	475	17
49	C. Lane	,, ..	330	126	456	18
63	N. Burston	,, ..	296	156	452	19
51	Reliable Poultry Farm ..	,, ..	284	128	412	20
50	Clevedon Poultry Farm ..	,, ..	276	133	409	21
66	Benwerren Egg Farm ..	,, ..	255	146	401	22
64	A. Bennett	,, ..	250	109	359	23
68	W. G. Osburne	,, ..	172	139	311	24
		Total ..	9,266	3,319	12,585	
		HEAVY BREEDS.				
		WET MASH.				
74	Oaklands Poultry Farm ..	Black Orpingtons ..	570	150	720	1
89	Brooklyn Poultry Farm ..	,, ..	522	126	648	2
87	S. Buscumb	,, ..	477	148	625	3
92	J. H. Wright	,, ..	476	134	610	4
85	Mrs. M. Coad	,, ..	466	143	609	5
83	L. McLean	,, ..	453	145	598	6
80	Mrs. T. W. Pearce ..	,, ..	447	150	597	=7
86	C. Ludwig	,, ..	450	147	597	=7
88	A. D. McLean	,, ..	448	131	579	9
72	Marville Poultry Farm ..	,, ..	441	115	556	10
93	L. W. Parker	,, ..	421	127	548	11
90	Excelsior Poultry Farm ..	,, ..	371	157	528	12
91	N. Papayanui	,, ..	353	153	506	13
78	*Reliable Poultry Farm* ..	,, ..	358	145	503	14
77	Mrs. G. R. Bald ..	White Plymouth Rocks ..	340	127	467	15
81	K. Courtenay	Faverolles ..	342	101	443	16
84	R. L. Trevana	Rhode Island Reds ..	288	126	414	17
73	E. W. Hippe	,, ..	301	110	411	18
71	C. E. Graham	Black Orpingtons ..	267	130	397	19
76	L. A. Errey	Silver Wyandottes ..	273	119	392	20
82	J. Ogden	Black Orpingtons ..	201	139	340	21
75	Mrs. Drake	Rhode Island Reds ..	202	122	324	22
		Total ..	8,467	2,945	11,412	

MONTHLY REPORT.

Strong north winds and a good deal of rain were the features of the weather during the past month. The birds, however, have mostly laid very well, and are in excellent condition. Broodies were numerous among the heavy breeds, although in the light breeds only one bird went broody for the term. The necessity—owing to the severe weather conditions—of building the birds up to fairly high condition in the winter will materially aid in good averages for some time to come. Rainfall for month, 170 points. Temperature—Lowest 41 deg., highest, 74 deg.

A. HART,
Chief Poultry Expert.

Department of Agriculture,
Melbourne, Victoria.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

Cultivation.

Orchard ploughing should now be finished, and the main work for the next few months will be an endeavour to keep the soil surface loose, friable, and well opened. The consolidation of the surfaces must be avoided, as a hard, compact surface means the loss of much soil moisture, by capillary attraction. So that after rains, heavy dews, the spray pump and other traffic, it will be as well to run the harrows over the surface of the soil, so as to keep the surface well broken and to maintain a good earth mulch. If the harrows are not sufficient to break the clods, a spiked or heavy roller should be drawn over it, and then harrowed. If the weather is at all dry it is advisable to plough only as much as may be harrowed in the same day. By immediately following up the ploughing with harrowing a minimum amount of moisture is lost by capillarity.

Green manure crops should now be ploughed under, and should they be very abundant in growth, a roller should be run over them and ploughed with a coulter attached. Any of these means will serve to get the crop underground, which is a desideratum.

In addition to the retention of soil moisture, cultivation of the orchards will suppress the weeds which rob the trees of food and moisture. The suppression of weeds is an important work in the spring and summer, and they should be rigorously hoed or cultivated out.

Spraying.

Spraying for all pests and diseases is, at this time of the year, an important work in the orchard. Bordeaux spraying for the black spot of apples and pears, for scabs and shothole in peaches and apricots, for the leaf curl of the peach and rust of the plums and peaches, should now be completed.

Where there are indications that previous sprayings have not been thoroughly successful, a lime sulphur spray should be given.

Wherever they are present, nicotine sprays should be given to combat the peach aphis, and the pear and cherry slug. For the latter pest, arsenate of lead should not be used if the cherries are within a month of ripening. Arsenate of lead is so tenacious, and thus it is likely to remain on the fruit until it is ripe, when it would be dangerous to the consumer. Thus, while this property of remaining on the fruit for a considerable time is of great value in the Codlin Moth spraying, it is quite of the opposite value when used for the pear and cherry slug. Either tobacco water or hellebore is useful for the eradication of this pest, as these substances do not remain long on the trees, and they are quite as effective as arsenate of lead.

Codlin moth spraying, too, will be in evidence this month. Owing to the early season, it is possible that the development of the moth will take place earlier. It is generally assumed that the appearance of the moth is coincident with the bursting of the flowers. This is not always so—the moths frequently come slightly later than the blooming period. Owing to the rapid expansion of the fruit, it is well to follow the first spraying with a second in a weak or ten days' time. Arsenate of lead is still the spray for the Codlin moth, nothing having been found to supersede it.

The Vegetable Garden.

A good tilth, and a well-pulverized soil, are the main soil necessities in the vegetable garden this month. Frequent cultivations will keep in the soil moisture, and will obviate the necessity for surface waterings. At the same time, it should be remembered that the vegetable garden requires more water than the flower garden, owing to the quick growth of the plants. Quickly-grown vegetables are more tender and more luscious than slowly-grown ones: thus a good water supply will need to be maintained. Weeds are great moisture-robbers, and they should be kept out of the vegetable garden at this time of the year.

Late plantings of tomatoes may now be carried out; all early-planted plants should be fed, staked, and the laterals pinched back. A little bone-dust or superphosphate may be given, but these are not equal to animal manures, if the latter are available. Chemical manures should only be given in limited quantities, 6 or 7 cwt. per acre would be a heavy dressing, and this works out at nearly 3 ozs. per square yard. Vegetable growers may easily try this for themselves, and it will soon be seen that 3 ozs. scattered over a square yard of surface will appear to be a very light dressing.

French beans, carrot, parsnip, celery, radish, peas, and turnip seeds may now be sown. Seeds of cucumber, melon, and pumpkin family may now be sown in the open ground. All seedlings may be transplanted on favorable days, and it will be well to sprinkle the tops as well as to water the roots.

Asparagus beds may be top-dressed with manure, and kept well weeded. Such weak growths that are not gathered for eating should be cut out of the beds.

Celery trenches will require attention at this time of the year; and to insure good, quick growth, frequent waterings will be necessary.

The Flower Garden.

Flower gardens are troubled with many pests at this time of the year. Rose aphis is one of the most prevalent; frequent applications of tobacco water will keep this pest in check. The hot winds should not be waited for so as to rid the garden of the pests, because a great deal of damage is done before the hot winds come. They should be sprayed in any case.

Rose mildew will also need combating. This may be done by dusting the bushes with sulphur while they are wet with the morning dew. The ground may also be sprinkled, as the fumes check the fungus.

Leaf-rolling or leaf-eating insects will need to be sprayed with arsenate of lead or Paris green.

The surface should be kept well hoed so as to conserve the moisture, especially after the frequent waterings that should be given.

Dahlia and chrysanthemums may be planted in soil that has been dug over two or three times, and each time digging in manure. The soil must not be too rich, but must be well drained.

Bulbs that have lost their foliage may be lifted, but do not cut the foliage, as this means loss of sap and energy.

Asters, zinnias, salvias, balsams, amaranthus, celosias, &c., lobelia, bedding begonia, iresines, alternantheras, &c., may now be planted out for summer and autumn flowers.

EFFECT OF SULPHATE ON CROPS.

Certain plants, says the *Pharmaceutical Journal*, seem to be benefited by treatment with sulphates, but others show less response to sulphates than to phosphates. Plants belonging to cruciferæ and leguminosæ are most favorably affected by treatment with calcium sulphate, although the latter appears to stimulate seed production in cereals such as barley and oats but have little or no effect on straw. In the case of clover the increase in the air-dry material due to calcium sulphate (gypsum) was 23 per cent. while with rape calcium sulphate mixed with a complete fertilizer gave a crop 17 per cent. heavier than with complete fertilizer alone; with radishes the increase in the crop under the same conditions was 9 per cent. The root development of red clover and rape showed a marked increase under the influence of the calcium sulphate dressing.

Free sulphur is harmful even in larger supplies of calcium carbonate. —Extract *Journal Industrial and Engineering Chemistry*, May, 1916.

REMINDERS FOR NOVEMBER.

LIVE STOCK.

HORSES.—**Continue to feed stable horses well; add a ration of greenstuff. Rug at night. Continue hay or straw, chaffed or whole, to grass-fed horses. Feed old and badly-conditioned horses liberally. If too fat, mares due to foal should be put on poorer pasture. Turn out workers due for a spell at grass. In**

view of sand trouble this year horses which have been paddocked all the winter should not be put to work until properly conditioned and any sand accumulation got rid of. A course of three or four bran mashes, after a twelve hours' fast, followed by 1 to 1½ pints of linseed oil, is helpful. Repeat in two or three days, if necessary. Colts to be gelded should be operated on before hot weather sets in.

CATTLE.—Except on rare occasions, rugs may now be used on cows on cold and wet nights only. Continue giving hay or straw. Beware of milk fever. Read up method of treatment in *Year-Book of Agriculture*, 1905. Have cows' milk weighed and tested for butter fat. Rear heifer calves from cows giving satisfactory results. Give calves a warm dry shed and a good grass run. Keep calves' premises scrupulously clean and regularly disinfected with Phenyle or floors sprinkled with quicklime. Feeding vessels must be kept clean. Skim milk should be scalded, unless it is known that the cows are healthy. Give the calves a regular quantity, and do not overfeed. Better too little than too much. Give milk at blood heat. Dehorn all calves, except those required for stud or show purposes.

PIGS.—Supply plenty of bedding in well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Read articles on breeding and feeding and housing in *Journals*, April, 1912, June, 1913, and May, 1915.

SHEEP.—Prepare for dipping. Ascertain exact contents of bath before mixing. Powder or paste dips have the most lasting effect, particularly where the lice have been bad. Hold sheep in the bath not less than half a minute; if badly infested, longer. Submerge heads twice, but allow them to rise quickly—most deaths after dipping are due to gross carelessness in holding sheep under too long, the dip wash being taken in on to the lungs. Dip rams, full grown sheep first, while bath is full, lambs last. Yard sheep over night. Dip while empty, and avoid excessive fouling the drainer. Commence early in the day, and allow sheep to dry before nightfall. Avoid travelling long distances to and from baths, and dipping sheep while overheated. Do not roughly throw sheep in. Avoid filthy baths; this increases a dead tip in hot areas.

When constructing new dips, remember moderate-sized ones are most economical, just as efficient, and can be more easily emptied as they become fouled, and if they are near water can be quickly filled.

POULTRY.—Provide plenty of green food and shade. Watch for vermin; spray crevices of perches and houses with crude carbolic acid, 1 in 50. Keep water clean and cool, and out of the sun. One packet of Epsom salts should be given to thirty birds through the mash. Remove all male birds from the flock. Infertile eggs are preferable when pickling, or when placed in cool storage.

CULTIVATION.

FARM.—Plant main crop of potatoes. Cut hay and silage. Weed early potatoes. Sow maize and millets. Weed tobacco beds, and water, if dry.

ORCHARD.—Ploughing, harrowing, and cultivating to be continued. Weeds to be kept down. Secure, pinch, and spray grafts with water. Spray frequently for codlin moth, pear and cherry slug, and peach aphis. Plant out citrus trees.

VEGETABLE GARDEN.—Hoe and mulch surface. Suppress weeds. Water where dry and hoe afterwards. Disbud and pinch back tomato plants. Sow celery, French beans, peas, lettuce, cucumber, melon, &c., seeds.

FLOWER GARDEN.—Water and mulch. Cultivate and keep down weeds. Thin out weak wood from roses. Prune early all flowering shrubs that have finished flowering. Lift and store bulbs. Plant out dahlias and chrysanthemums. Liquid-manure herbaceous perennials.

VINEYARD.—Field grafts require careful attention in the way of removal of suckers and scion roots. Cultural work, such as scarifying and hoeing, should be actively pushed forward, so as to provide as good a "mulch" as possible during summer. Proceed with tying up, stopping and topping. Avoid excessive topping, summer pruning being usually more injurious than useful in warm, dry climates. Cincture Zante currant vines after flower caps have fallen. Apply second sulphuring just before blossoming, wherever Oidium was prevalent last year.

Cellar.—Same as last month.